

STRUCTURE OF THIS MICROCARD  
(BASIC INSTRUCTIONS)

A02 = How to use this microcard	1	2	3	4
A01 = Structure of microcard			SIS	
B01 = Trouble-shooting chart	A-***X*	X*XXX	XXXXX	XXXXX *XXXX X
	B-*XXXX	XXXXX	XXXXX	XXXXX XXX
	C-XXXXX	XXXXX	XXXXX	XXXXX XXX
	D-XXXXX	XXXXX	XXXXX	XXXXX XXX
	E-XXXXX	XXXXX	XXXXX	XXXXX XX
	F-XXXXX	XXXXX	XXXXX	XXX
	G-XXXXX	XXXXX	XXXX	
	H-			
	J-			
	K-			
	L-			
	M-			
N01 = Service information	N-*XXXX	XXXXX	XXXXX	XXX *X XX*
	12345	67890	12345	67890 12345 678
		1	2	
			Index	
N28 = Table of contents and publication information				

- 1 = Special features  
2 = Safety and precautionary measures  
3 = Test equipment and tools  
4 = Installation position of components

- a. Read from left to right.  
b. Title of micropicture (appears on each micropicture).

E16	Product/component/test step	
	Coordinate	
c. Limits of section		
<u>==&gt;</u>	<u>&lt;==</u>	<u>&lt;==</u>
Beginning	Mid-section	End
		One-page section
A01		=> <=

HOW TO USE THE MICROCARD

Trouble-shooting instructions for following system:

Motronic M 2.1

Descriptions, photographs, terminal designations and special features refer to the following vehicle:

Porsche 944 S  
with 2.5l 4-cylinder - 4-valve engine  
Year of manufacture 06.86.->

These basic instructions represent detailed trouble-shooting instructions. They are not to be used as vehicle-specific instructions.

Note! Descriptions and photographs may differ from the vehicle-specific brief instructions.

Binding set values, terminal assignments and special features are to be taken exclusively from the vehicle-specific brief instructions.

See microcard KFZ-00.. for brief instructions.

A02		=> <=
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## SPECIAL FEATURES

- \* Motronic M 2.1 with self-diagnosis, final-controlling-element diagnosis, switching-signal diagnosis and 4-position flashing-code output.
- \* Variant coding by way of coding plugs for adaptation to various grades of fuel and country-specific versions.  
See Table, Coordinate A 05 for assignment of coding plugs.
- \* Control unit with 55-pole plug.
- \* Joint sensor for engine speed and reference mark.
- \* Tank-ventilation system in all vehicles.
- \* Lambda closed-loop control (country-specific version).
- \* Injection valves with copper coil.
- \* Series resistors in positive lead to injection valves.
- \* Knock control for individual cylinders with two knock sensors.
- \* Magnetic pulse generator (Hall generator) for cylinder detection and knock-sensor switching.
- \* External ignition output stage (TI trigger box).

## SPECIAL FEATURES (continued)

Self-diagnosis, final-controlling-element diagnosis, input-signal diagnosis and their flashing codes have been realized only with control unit 0 261 200 187.

The control unit installed at the start of series production, namely 0 261 200 080, does not feature self-diagnosis. With these vehicles, trouble-shooting is to be performed by checking all the components and functions listed in the self-diagnosis, final-controlling-element diagnosis and switching-signal diagnosis. The procedure outlined in the trouble-shooting chart is then to be employed.

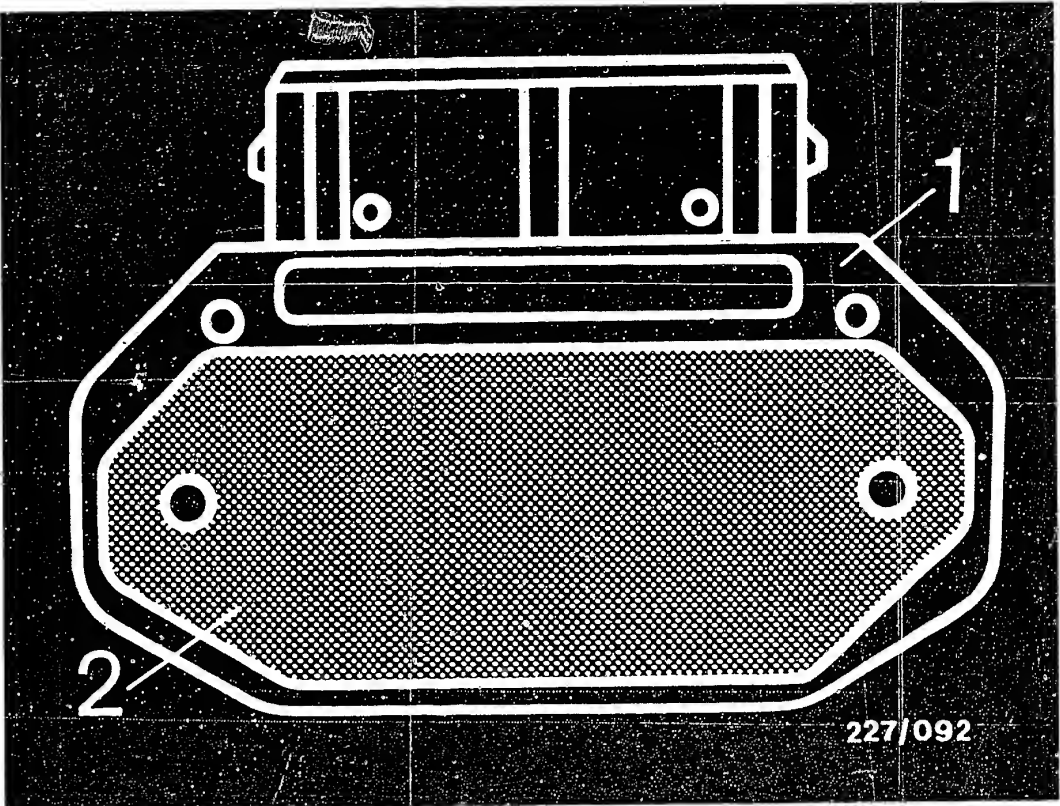
This vehicle can be fitted with an alarm system (if specially requested).

SPECIAL FEATURES (continued)

Various maps are integrated into the control unit, so as to cover the various legal requirements in different countries and so as to limit the number of control units.

In order to call up these maps, a 2-pole and a 3-pole plug connection are brought out of the Motronic wiring harness. These plug connections are differently configured depending on country variant. (See table below).

Country	Map switch 2-pole	Variant switch 3-pole
USA-Fed. FRG- Lambda	_____	_____
USA-Cal. Japan Lambda	_____	Bridge to battery voltage 928.607.421.00
ECE	_____	Bridge to ground 928.607.422.00
Sweden	_____	Resistance to ground (6.8 k $\Omega$ ) 944.612.522.00
Aust- ralia Lambda	Bridge to ground 944.612.515.00	_____



1 = Trigger box                      2 = Base

SPECIAL FEATURES (continued)

- \* Apply thermolube to base of ignition trigger box (picture) before attaching it to heat sink.
- \* Apply thermolube with suitable object (screwdriver, match or the like). Do not apply thermolube to varnished parts.

## SPECIAL FEATURES (continued)

### Tank-ventilation system

All vehicles (with and without Lambda closed-loop control) are equipped with a tank-ventilation system.

The fuel vapours occurring in the fuel tank are stored in the carbon canister.

#### Function:

A diaphragm valve, which is controlled by the intake-manifold pressure, is fitted in the carbon-canister line.

As soon as the engine is running, the diaphragm valve opens and the fuel vapours are passed to the tank-ventilation valve controlled by the Motronic.

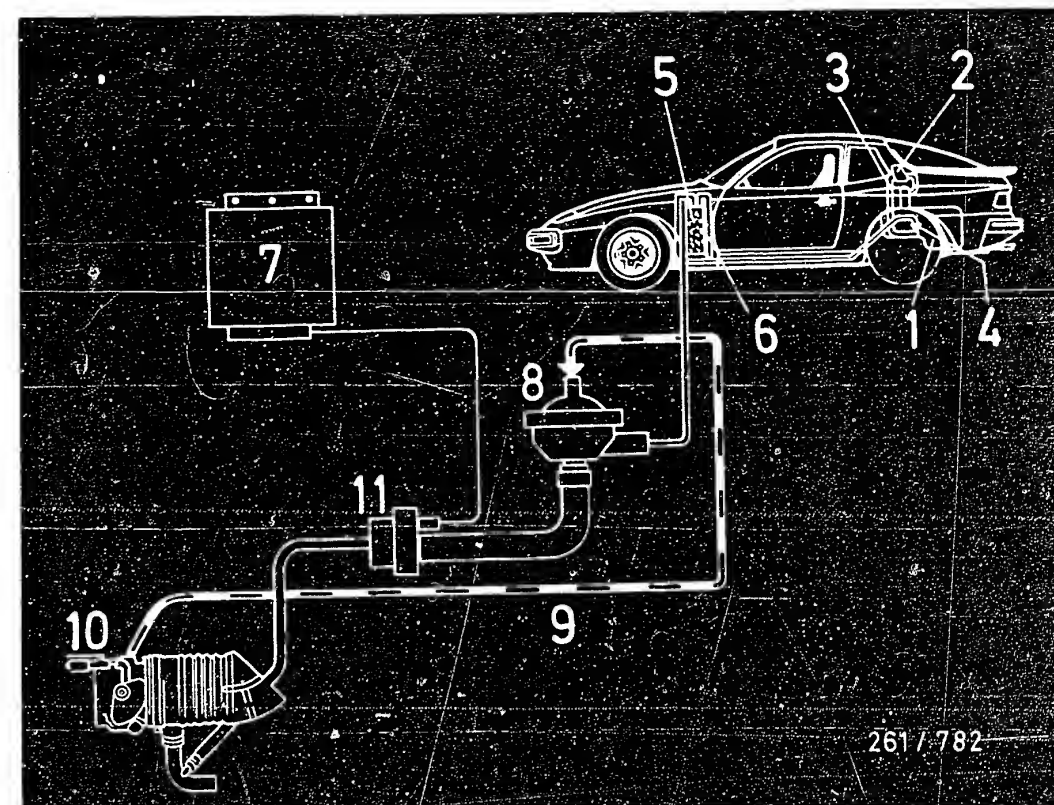
In the case of vehicles without lambda closed-loop control, the tank-ventilation valve is actuated as soon as the engine is at operating temperature and the idle contact opens (part-load operation).

In the case of vehicles with lambda closed-loop control, the tank-ventilation system functions when idling as well with the engine at operating temperature and the lambda closed-loop control in operation.

The tank-ventilation valve is constantly open when no voltage is being applied.

The diaphragm valve, which is controlled by the intake-manifold pressure, is closed and prevents fuel vapours entering the intake manifold.

This likewise prevents engine dieseling (run-on).



- 1 = Fuel tank
- 2 = Expansion tank
- 3 = Ventilation line
- 4 = Safety valve
- 5 = Carbon canister
- 6 = Scavenging-air line
- 7 = Motronic control unit
- 8 = Diaphragm valve
- 9 = Intake-manifold vacuum line
- 10 = Throttle-valve assembly
- 11 = Tank-ventilation valve

Diagram of tank-ventilation-system lines

## SPECIAL FEATURES (continued)

## SAFETY AND PRECAUTIONARY MEASURES

Always observe safety and precautionary measures in order to avoid hazards to persons and damage to the engine, the trigger box and control unit, and the ignition system.

### CAUTION!

High-performance ignition system with dangerous high and low voltages!

Contact with voltage-carrying parts or terminals can be fatal (on both primary and secondary sides).

For compression test, detach main relay in order to prevent undesirable injection by injection valves and high-voltage flashovers.

Do not short-circuit ignition coil term.1 to ground (e.g. for stopping the engine). Ignition coil and possibly control unit shall be destroyed.

Never connect positive terminal of battery to ignition coil term.1. Control unit shall be destroyed.

When fitting an alarm system, following directions of installation instructions for Motronic vehicles or SIS microcard PKW 012. Ensure that the alarm relay is not disturbed by external fields (e.g. ignition cables) and therefore responds incorrectly.

Knock-sensor leads must be shielded and kept separate from H.T. leads.

Fit fastening screw of knock sensors without washer, spring lock washer, toothed lock washer etc.  
Merely secure fastening screw with locking paint.

## SAFETY AND PRECAUTIONARY MEASURES (continued)

Never start engine without battery being firmly connected (battery terminals bolted tight). Do not disconnect battery from the vehicle electrical system with the engine running.

Do not use a fast charger for starting the engine.

Render starting assistance only with a second 12 V battery and jumper cables.

Caution! Due to non-uniform requirements placed by vehicle manufacturers on electronic products, we do not recommend the use of 24 V batteries for starting assistance.

When charging the battery in the vehicle or rendering starting assistance, observe the directions given in the operating instructions of the fast charger as well as those provided by the vehicle manufacturer.

Prior to charging or fast-charging the battery, disconnect it from the vehicle electrical system.

Incorrect polarity of the supply voltage, e.g. due to incorrect connection of the battery or ignition coil, can lead to irreparable damage to a control unit.

Do not connect or disconnect the wiring harness from control units or trigger-box with the ignition switched on.

Prior to exposure to temperatures above +80°C (paint-dry installation) remove control units.

Control units must be removed before electric spot welding.

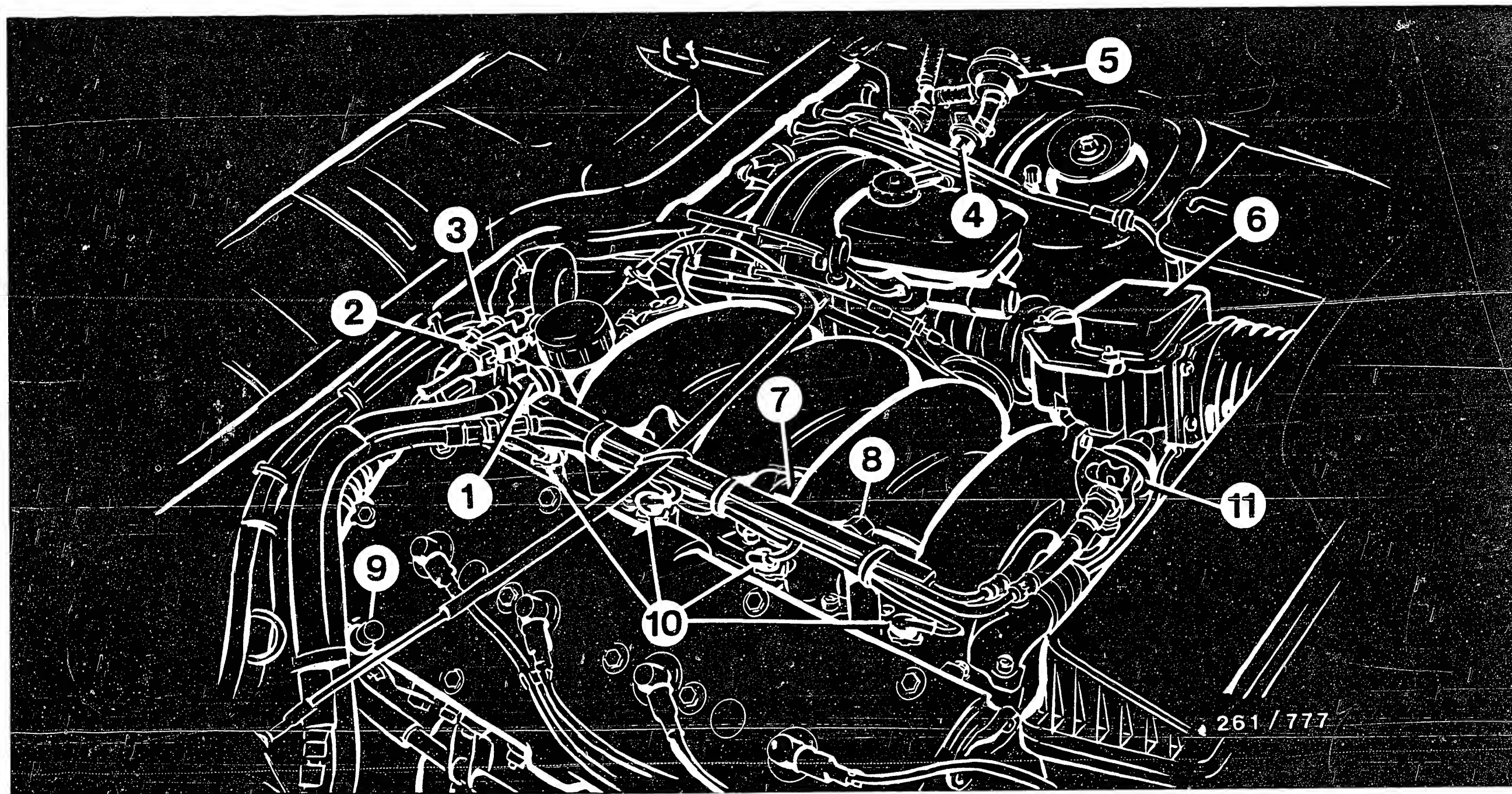
## TESTERS AND TOOLS

Name	Designation	Part No.
Motortester	e.g. MOT 201 MOT 300 MOT 400	0 684 000 201 0 684 000 300 0 684 000 400
Diagnosis cable for measuring spark-advance angle		1 684 463 158
Exhaust-gas analyzer	e.g. ETT 008.02 or ETT 008.03	0 684 100 802 0 684 100 803
Digital multimeter or multi-range meter (min. internal resistance 20 k $\Omega$ /V)	e.g. MMD 301	0 684 500 301  commercially available e.g. Fluke multi-meter 23 or 27
Pressure gauge, 6 bar or Pressure meas. device or Pressure meas. device (no longer available)	Qual. class 1.0 Scale div.0.1bar	1 687 231 154  KDJE-P 100 KDEP 1034
Hose as connection piece for KDJE-P 100 and KDEP 1034	Threaded conn. M 12 x 1.5	KDJE-P 100/3
Thermolube		5 942 860 003
Screw locking paint		5 942 245 003

## TESTERS AND TOOLS (continued)

Name	Part No.
Lubricant for engine-speed and reference-mark sensor	Molykote Longterm 2, commercially available
Chassis dynamometer e.g. LPS 96 or LPS 002	0 680 017 001 0 680 100 200
Test lead 2-pole, for measuring resistances and signals e.g. at injection valves	1 684 463 093
Test leads for proper connection of testers to component plugs	KDZS 0004 (2.8 mm wide)  KDZS 0005 (6.3 mm wide)
Fitting paste VS 14016 Ft for lambda sensor and exhaust screw plug	5 960 080 105
Clamp for pinching off fuel and air hoses	Commercially available
Torque wrench Range 5 ... 50 Nm	Commercially available



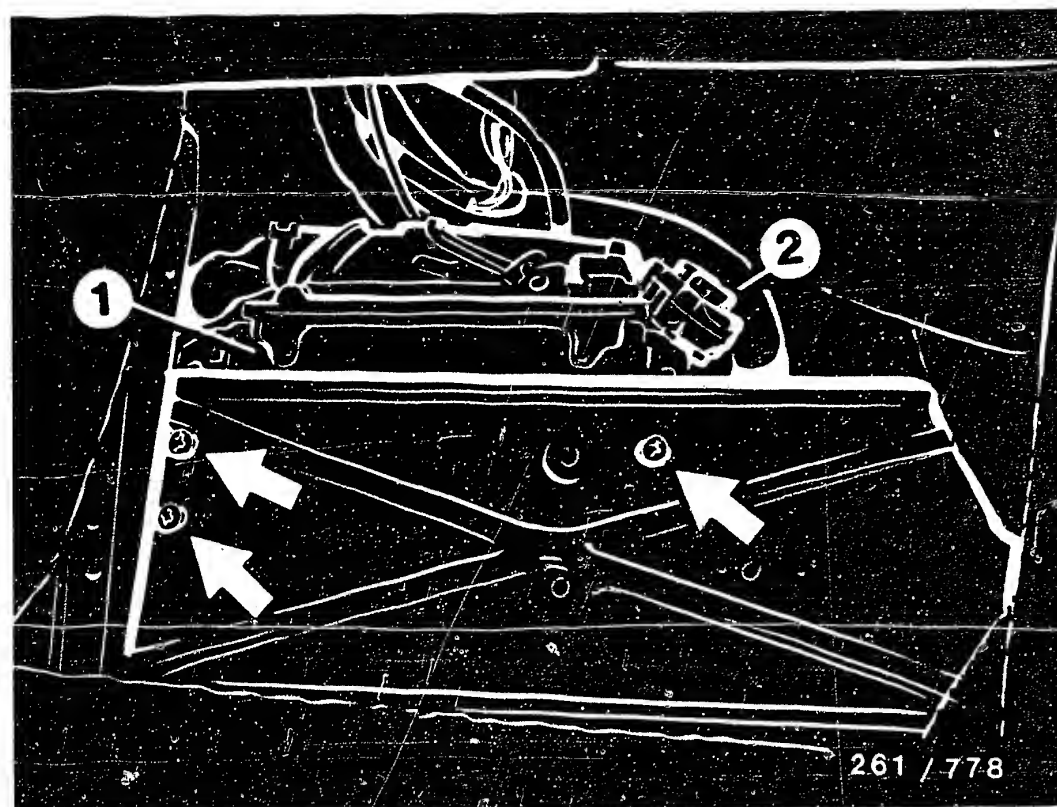


- 1 = Fuel pressure regulator
- 2 = Plug connection, engine-speed/  
reference-mark sensor
- 3 = Plug connection,  
Lambda sensor
- 4 = Tank-ventilation valve

- 5 = Diaphragm valve for  
tank ventilation
- 6 = Air-flow sensor
- 7 = Idle actuator
- 8 = Test connection for  
fuel pressure

- 9 = CO sampling point for  
vehicles with catalytic converter
- 10 = Solenoid-operated injection valves  
1 - 4
- 11 = Pressure damper

#### INSTALLATION POSITION OF COMPONENTS

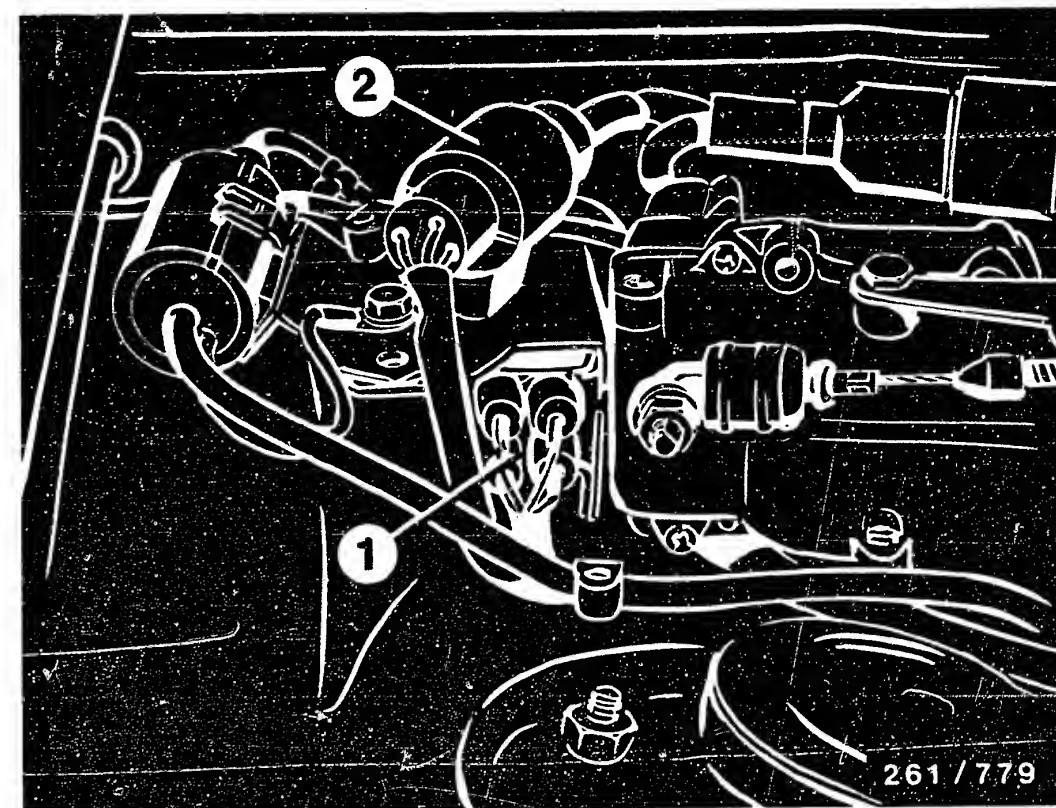


- 1 = Motronic control unit  
2 = Diagnosis plug

#### INSTALLATION POSITION OF COMPONENTS (CONTINUED)

The Motronic control unit is located in the passenger-side footwell beneath the floor plate.

Loosen three screws (arrows) to remove control unit.

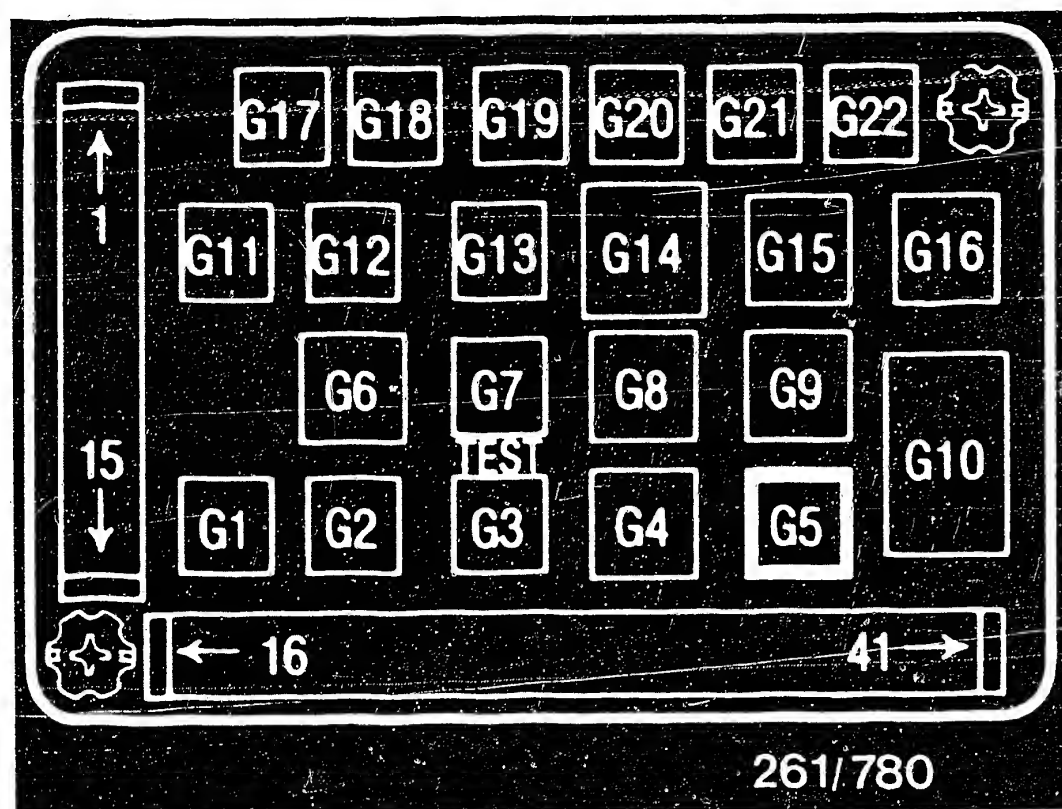


- 1 = Series resistors  
2 = Plug connection

#### INSTALLATION POSITION OF COMPONENTS (CONTINUED)

The series resistors are located on the right in the direction of travel at the bulkhead.





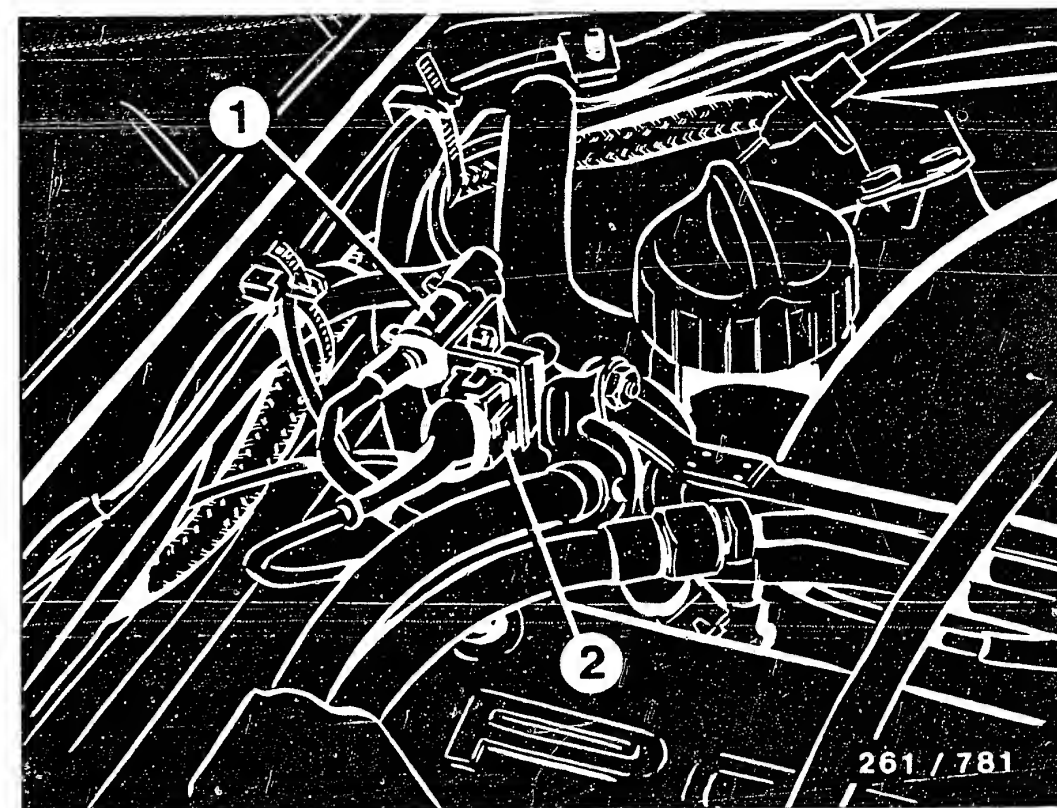
# INSTALLATION POSITION OF COMPONENTS (CONTINUED)

## \* Motronic relay:

In central-electrics console, relay G5  
(see picture).

## \* Fuse for electric fuel pump:

In central-electrics console, fuse No. 34



1 = Plug connection, Lambda sensor

2 = Plug connection, engine-speed/reference-mark  
sensor

# INSTALLATION POSITION OF COMPONENTS (CONTINUED)

## INSTALLATION POSITION OF COMPONENTS (Continued)

### Ignition trigger box (1):

On a heat sink (2) at left-hand inner fender, in vicinity of headlamp, top picture.

### Throttle-valve switch:

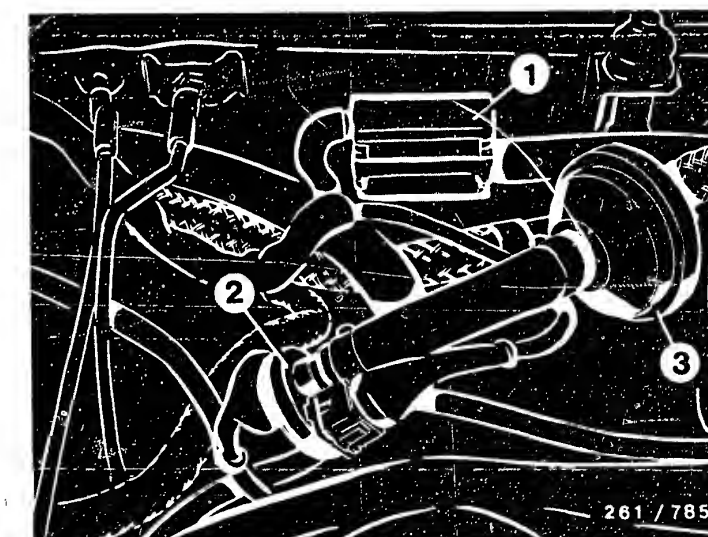
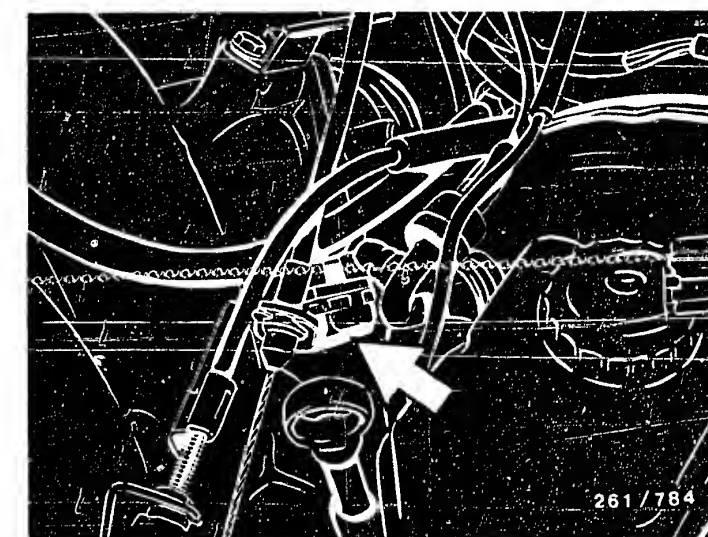
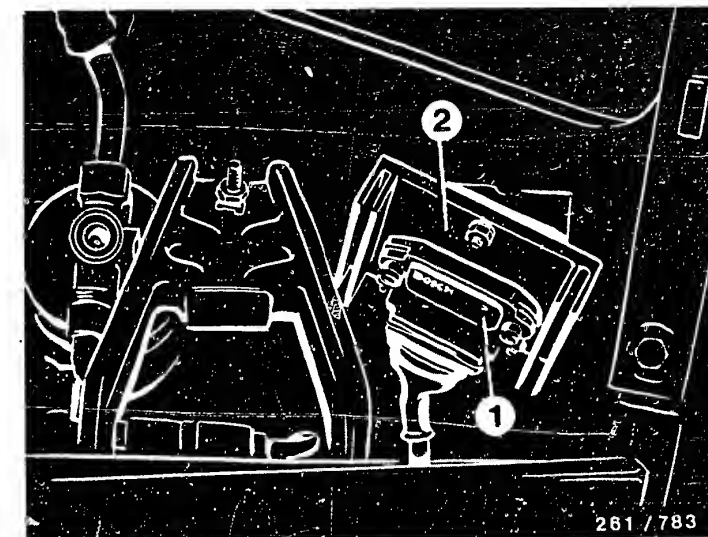
Beneath throttle-valve assembly, see center picture, arrow.

### Engine connector:

At left-hand bulkhead, in the vicinity of the brake booster, see bottom picture, item 1.

### Tank-ventilation system:

The tank-ventilation valve (2) and diaphragm valve (3) are located at the left-hand bulkhead, see bottom picture.



## INSTALLATION POSITION OF COMPONENTS (Continued)

Magnetic pulse generator (Hall generator):

Behind driving gear of exhaust camshaft.

Top picture, item 1: plug connection of magnetic pulse generator.

Removal instructions: Loosen two screws, remove magnetic pulse generator.

Rotor plate of magnetic pulse generator can only be renewed by a Porsche agent, since special tools are required for adjusting the toothed belt.

Top picture, item 2:

The ignition coil is located at the right-hand inner fender.

The coolant temperature sensor is located at the front of the engine beneath the intake manifold, see center picture, arrow.

Bottom picture:

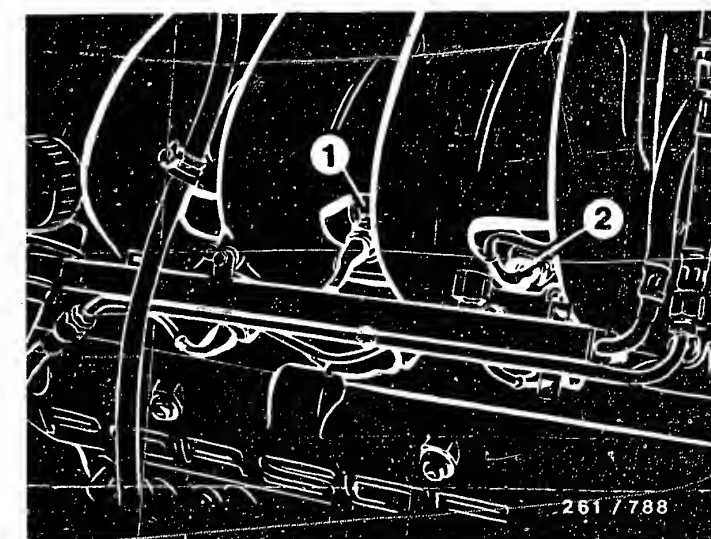
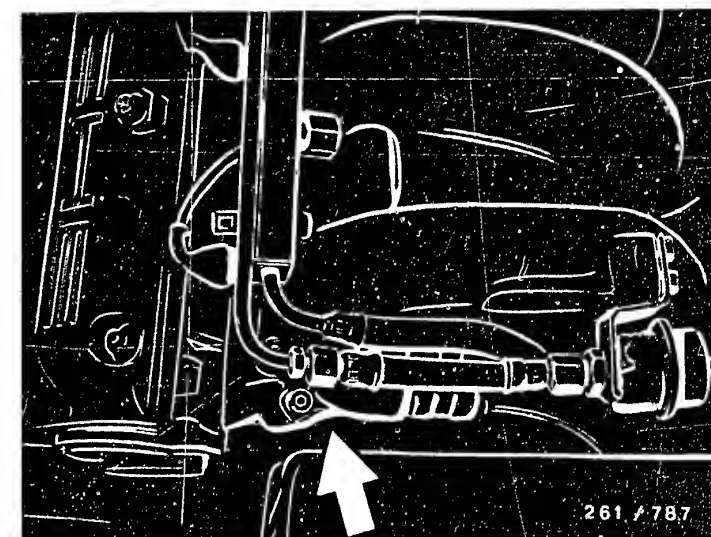
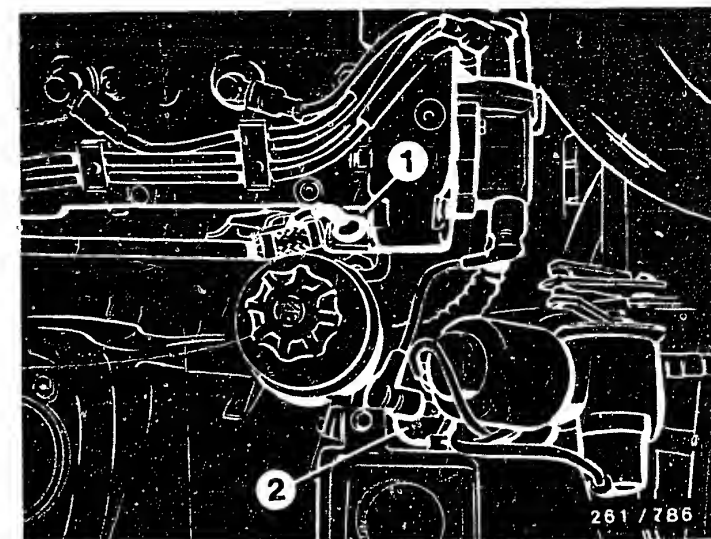
1 = Idle actuator

2 = Knock sensor 1 (cylinders 1+2): beneath manifold between cylinders 1 and 2.

The knock sensor 2 (cylinders 3+4, not visible in picture) is located beneath the intake manifold between cylinders 3 and 4.

Removal instructions:

For space reasons, the intake manifold must be removed, so as to be able to tighten the knock sensor to the prescribed torque.



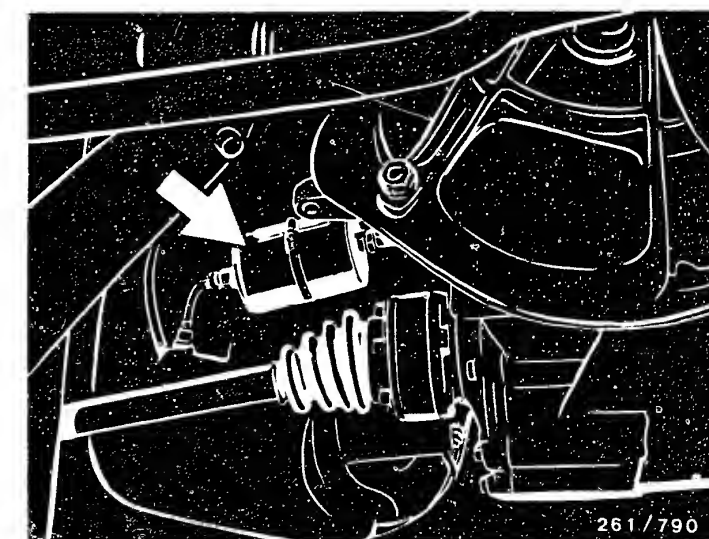
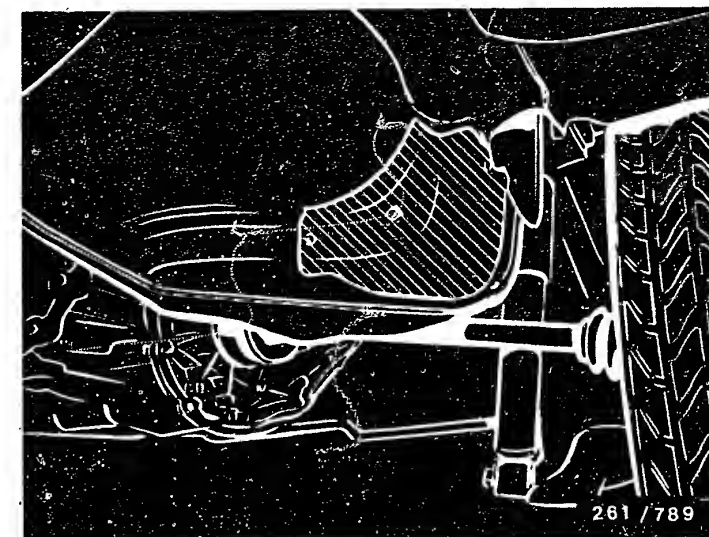
## INSTALLATION POSITION OF COMPONENTS (continued)

The electric fuel pump is located at the fuel tank beneath a plastic cover. See top picture, arrow.

Fuse for electric fuel pump: No. 34 in central-electrics console.

The fuel filter is located on the right in the direction of travel above the drive shaft. See bottom picture, arrow.

The heated lambda sensor is located in the joint exhaust pipe.



## HOW TO USE TROUBLE-SHOOTING CHART AND TROUBLE-SHOOTING PROGRAM

The TROUBLE-SHOOTING CHART starts on coordinate B03 and contains customer complaints (fault symptoms) with several possible causes (component faults) in each case as well as coordinate references for detailed trouble-shooting. If no coordinate reference is given, this is a cause for which no test instructions are required.

Components that are checked by the self-diagnosis or with the universal test adapter are not listed in the trouble-shooting chart.

If the customer complaint is clear, proceed with trouble-shooting in the given order of possible causes one after the other and step by step.

Always start trouble-shooting with the self-diagnosis (if applicable) or with the universal test adapter (if provided). Only then continue with the trouble-shooting chart.

If the customer complaint is not clear, check all the causes listed in the trouble-shooting chart. To prevent possible incorrect measurements, check all causes in the order given (owing to the interlinking of test steps).

If the cause of the customer complaint has still not been eliminated after testing all possible faults, fit new prescribed ignition coil and/or trigger box/control unit.

## HOW TO USE TROUBLE-SHOOTING CHART AND TROUBLE-SHOOTING PROGRAM (continued)

The TROUBLE-SHOOTING PROGRAM contains all system and component checks mentioned in the trouble-shooting chart. It is divided into three rows of boxes.

The left-hand column contains test instructions and set values. The center column contains instructions on trouble-shooting and fault rectification. The right-hand column contains the illustrations/terminal diagrams belonging to the text, with explanations.

If the questions in the left-hand column can be answered conclusively with "yes", continue trouble-shooting with the next box down.

If the answer to the question is "no", branch to the center column and carry out the tests in the order given there. After rectifying a fault repeat the test as a check.

### REQUIREMENTS FOR TESTING:

- Battery fully charged
- Engine in good mechanical condition (e.g. compression, valve clearance etc.)
- Engine at operating temperature, approx. +80°C (where necessary)
- Proper seating of all plug connections of wiring harness



## TROUBLE-SHOOTING CHART

Customer complaint (fault symptoms)

1. Starting motor operates, engine fails to start or starts only with difficulty.
2. Engine starts but then dies.
3. Idle problems (engine speed, exhaust gas).
4. Poor throttle take-up, flat spot during acceleration.
5. Engine missing (ignition, injection).
6. Maximum engine power/top speed not reached.
7. Fuel consumption too high.
8. Engine running on (dieseling).
9. Engine pinging/knocking.
10. Engine overheating.
11. Fault lamp.

												Cause (component fault)	Coord.
*	*	*	*	*	*	*	*	*	*	*	*	Self-diagnosis	B05
*	*	*	*	*	*	*	*	*	*	*	*	Final-cont.-element diagn.	B05
*												Voltage at control unit	D13
*												Engine-speed/reference-mark sensor	D15
*		*			*	*						Fuel pressure	D25E09
				*								Fuel delivery	E01
*	*	*	*	*	*	*						Air-flow sensor	E15
*	*	*	*									Air intake system	F03
*		*	*	*	*							Trigger box	E03
*		*		*	*							Ignition coil	E07

## TROUBLE-SHOOTING CHART (CONTINUED)

Customer complaint (fault symptoms)

1. Starting motor operates, engine fails to start or starts only with difficulty.
2. Engine starts but then dies.
3. Idle problems (engine speed, exhaust gas).
4. Poor throttle take-up, flat spot during acceleration.
5. Engine missing (ignition, injection).
6. Maximum engine power/top speed not reached.
7. Fuel consumption too high.
8. Engine running on (dieseling).
9. Engine pinging/knocking.
10. Engine overheating.
11. Fault lamp.

												Cause (component fault)	Coord.
		*	*	*	*	*						Secondary pattern	F13
*	*	*	*	*	*	*	*	*				Ignition point	F15
	*											Idle speed, CO	F27
	*											Overrun cut-off	F11
	*	*	*									Interference-suppr. resist.	F13
	*	*	*									Noise test	E19
				*								Interference	—
				*					*			Throttle valve	E23
	*	*				*						Tank ventilation	A07F07
	*	*										Lambda closed-loop ctrl.	—
*	*	*	*	*	*	*	*	*	*	*	*	Control unit	D11

USE OF SELF-DIAGNOSIS, SELF-DIAGNOSIS TEST  
TABLE, AND SELF-DIAGNOSIS TROUBLE-SHOOTING PROGRAM

The control unit installed in this vehicle  
incorporates self-diagnosis. For this reason,  
trouble-shooting must start with  
self-diagnosis.

Activation of self-diagnosis is  
described starting on Co-ordinate B07.

The self-diagnosis test table starting on B13  
includes:

- Fault indication (flashing code)
- Components or system functions  
inspected
- Test instructions/conditions
- Connection terminals
- Set-value information
- Co-ordinate information for trouble-shooting and  
elimination in the subsequent self-diagnosis  
trouble-shooting program.

USING THE SELF-DIAGNOSIS, SELF-DIAGNOSIS  
TEST TABLE AND SELF-DIAGNOSIS TROUBLE-SHOOTING PROGRAM  
(Continued)

The self-diagnosis trouble-shooting program is divided  
into three columns starting at Coordinate B21.

The left-hand column contains test instructions  
and set values.

The center column contains information on trouble-  
shooting and on how to rectify the fault.

The right-hand column contains the illustrations/  
terminal diagrams belonging to the text, together  
with explanations.

If the questions in the left-hand column can be answered  
conclusively with "yes", continue trouble-shooting with  
the next box down.

If the answer to the question is "no", branch to  
the center column and carry out the tests in the order  
given there.

After rectifying a fault, repeat the test as a  
check.

If the self-diagnosis indicates a fault, but no  
system fault or component fault was found during  
trouble-shooting, try replacing the control  
unit.

If no more fault is indicated in self-diagnosis  
and the customer complaint has still not been  
eliminated (symptom of trouble), continue  
trouble-shooting with the trouble-shooting chart  
starting at Coordinate B03.

## SELF-DIAGNOSIS

The self-diagnosis is assessed with the evaluation unit  
K D A W 9 9 8 0

With this vehicle, the self-diagnosis can distinguish between faults currently present and faults which occurred briefly. Two flashing codes are thus always given in the self-diagnosis test table and in the self-diagnosis trouble-shooting program.

Example: Coolant temperature sensor

Flashing code 1 1 1 4 (fault present).

Flashing code 1 2 1 4 (fault occurred briefly).

In addition to the familiar self-diagnosis function, this vehicle features final-controlling-element and input-signal diagnosis as well as system adaptation for idle-speed control.

Final-controlling-element and input-signal diagnosis make it possible to perform active tests on the inputs and outputs of the Motronic control unit as well as on the connected components and connecting leads.

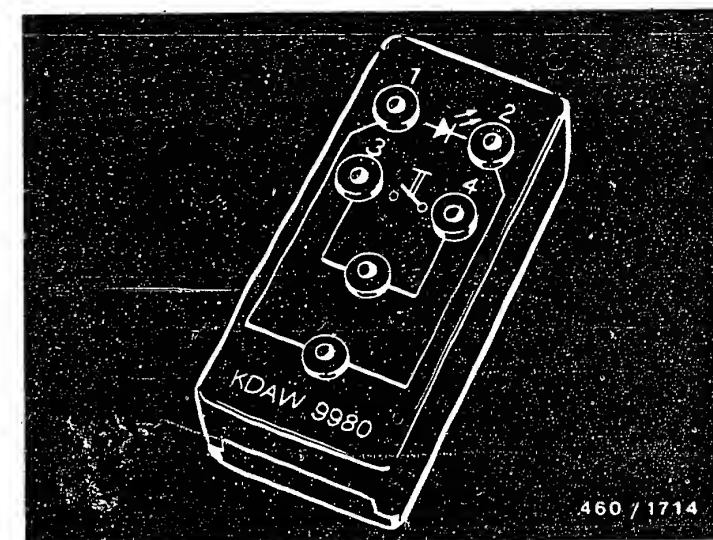
The system adaptation makes it possible to rapidly adjust the control unit to the operating status of the engine. This function is to be stimulated, if, for example, a complaint is received about the idle speed dipping after an overrun phase.

Connect evaluation unit KDAW 9980:

Socket no. 1 to diagnosis plug, term. 1 (positive of term. 15)  
Socket no. 2 to diagnosis plug, term. 11 (output of fault lamp)  
Socket no. 3 to diagnosis plug, term. 2 (negative)  
Socket no. 4 to diagnosis plug, term. 12 (L-lead)

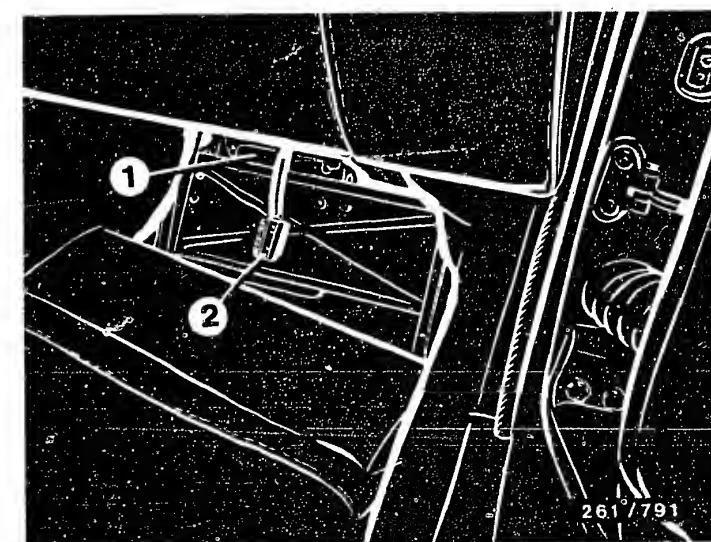
### N O T E :

If no evaluation unit KDAW 9980 is available, an alternative is to connect a commercially available LED test lamp to term. 1 and term. 11 of the diagnosis plug.  
A stimulation lead (user-manufacture) is to be connected to term. 12 of the diagnosis plug.  
To effect stimulation, connect other end of stimulation lead to term. 2 of diagnosis plug.



Evaluating unit KDAW 9980

1 = Motronic control unit  
2 = Diagnostics plug



## Activation of self-diagnosis

- + Switch on ignition, fault lamp comes on.  
Wait for at least 2.5 seconds prior to stimulation.
- + Stimulation: Press button of evaluation unit for between 2.5 and 5 seconds.
- + The fault lamp lights up for approximately 2.5 seconds (starting pulse) after releasing the button.
- + The starting pulse is followed by the actual fault output.

## Evaluation of flashing fault code.

The flashing code for each fault consists of four flashing-pulse blocks. Each block represents a number and contains between 1 and 5 pulses. One pulse corresponds to the number 1; 5 pulses to the number 5. Each pulse is accompanied by brief lighting up of the fault lamp. The pause between the blocks is longer than the pause between the individual pulses.

The respective flashing code word (e.g 1214) is constantly repeated. The fault lamp lights up for approximately 2.5 seconds between the flashing code words for delimitation purposes.

Renewed pressing of the button causes the next fault to be output commencing with a starting pulse of 2.5 seconds duration. A maximum of 5 faults can be stored.

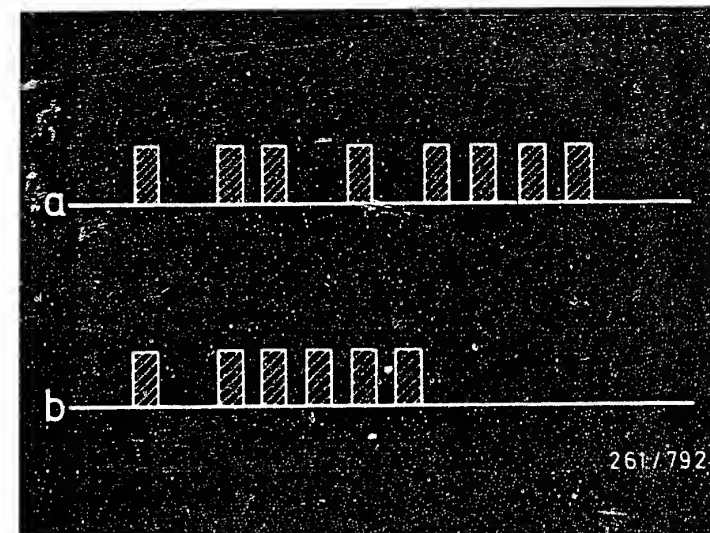
## NOTE :

The flashing codes for "end of output" (1) and "no fault stored" (15) are one-position and two-position codes respectively.

## Possible flashing-code outputs following multiple stimulation.

1st stimulation process: fault output or no fault stored (flashing code 15).

2nd stimulation process: next fault is output or, if no further fault is stored, flashing code "end of output" ( 1 ) appears.



a = Fault code 1214  
b = Flashing code 15  
(no fault stored)  
Shaded pulse area =  
Fault lamp lights up

### 3rd stimulation process:

Once flashing code "end of output" has been indicated, exit from self-diagnosis mode by effecting stimulation for between 2.5 and 5 seconds.

The self-diagnosis can be called up again after switching the ignition off/on.

Stimulation for more than 10 seconds causes the fault memory to be cleared.

The fault memory may also be cleared if the battery or the control unit is disconnected for more than 10 seconds.

### Activation of final-controlling-element and input-signal diagnosis

Ignition OFF.

Press button in evaluation unit and hold it down!

Switch on ignition.

Release button after waiting for at least 2.5 seconds.

The first "final controlling element" as per the test table is continually actuated. The corresponding flashing code is indicated at the same time.

The next final controlling element is actuated by pressing the button again for between 2.5 and 5 seconds.

Input-signal diagnosis commences after pressing the button for the third time.

The flashing code of the checked input signal is indicated and goes out if the signal is O.K.

### Activation of system adaptation

Ignition OFF.

Press button in evaluation unit and hold it down!

Start engine at operating temperature and allow it to idle.

Release button after waiting for at least 2.5 seconds.

The flashing code 1 4 1 1 is indicated during the adaptation period.

Adaptation is terminated by pressing the button for between 2.5 and 5 seconds.

### N O T E :

Proper functioning of the throttle-valve-switch idle contact is to be checked before activating the system adaptation.

The throttle valve must not be actuated during system adaptation.



## SELF-DIAGNOSIS TEST TABLE

Fault indication Flashing code	Testing of component/function	Test instructions/Test conditions	Terminals	Set values	Coordinate
1	Control unit	End of self-diagnosis output			
1 5	Control unit	No fault stored.			
1 1 1 1 1 2 1 1	Voltage supply	Voltage supply for control unit too low or too high. Check battery and alternator. Check voltage-supply leads for contact resistance.	37(+) 19(-)		C13
1 1 1 2 1 2 1 2	Throttle-valve switch Idle contact	Fault: Idle contact doesn't open.  Idle contact closed in off-position: Depress accelerator slightly:	52	0 Ω infinity Ω	C15
1 1 1 3 1 2 1 3	Throttle-valve switch Full-load contact	Fault: Full-load contact always closed.  Full-load contact closed in full-throttle position: Release accelerator somewhat:	53	0 Ω infinity Ω	C19
1 1 1 4 1 2 1 4	Coolant temperature sensor	Check temperature sensor and lead for open-circuit and short-circuit to ground  Temperature-sensor resistance:      at +15...+30°C : at approx. +80°C :		1450...3300 Ω 280... 360 Ω	C05
1 1 2 1 1 2 2 1	Air-flow sensor	Check lead to term. 7 for open-circuit, short-circuit to ground or to positive (5V or B+) as well as for contact with term. 12 and term. 26.  Check leads to term. 12 and term. 26 for open-circuit.  Check air-flow-sensor resistances: between term. 26 and term. 7 (deflect sensor flap): between term. 26 and term. 12:	7,12,26	See brief instructions	B23

# SELF-DIAGNOSIS TEST TABLE

Fault indication Flashing code	Testing of component/function	Test instructions/Test conditions	Terminals	Set values	Coordinate
1 1 2 3 1 2 2 3	Lambda closed-loop control on rich or lean stop (vehicles with catalytic converter only)	Check CO content, fuel pressure and tank-ventilation valve. Check intake system for leaks. Perform electrical and mechanical tests on air-flow sensor and tank-ventilation valve. Fault may also be indicated if tank run empty.		See brief instructions	C03
1 1 2 4 1 2 2 4	Lambda sensor (vehicles with catalytic converter only)	Lambda-sensor lead: open-circuit or short-circuit to ground or battery voltage. Watch out for worn cable insulation! Sensor heating defective. Sensor blocked.	28		C01
1 1 2 5 1 2 2 5	Intake-air temperature sensor	Check temperature sensor and lead for open-circuit and short-circuit to ground.  Temperature-sensor resistance at +15...+30°C :	44  1 4	See brief instructions	C09
1 1 3 1 1 2 3 1	Knock sensor 1	Checks leads to knock sensor 1 for open-circuit and mutual contact. Visually inspect knock-sensor plug (mech. damage, oxidation). Watch out for worn cable insulation! Check knock-sensor tightening torque.	11 30  —	See brief instructions	C23
1 1 3 2 1 2 3 2	Knock sensor 2	Check leads to knock sensor 2 for open-circuit and mutual contact. Visually inspect knock-sensor plug (mech. damage, oxidation). Watch out for worn cable insulation! Check knock-sensor tightening torque.	29 30  —	See brief instructions	C27
1 1 3 3 1 2 3 3	Knock detection	Control unit defective			—

SELF-DIAGNOSIS TEST TABLE

Fault indication Flashing code	Testing of component/function	Test instructions/Test conditions	Terminals	Set values	Coordinate
1 1 3 4 1 2 3 4	Magnetic pulse generator (Hall generator)	Check for open-circuit in magnetic-pulse-generator voltage and control leads.  Check voltage supply at magnetic-pulse-generator plug, term. 1(+) and term. 3(-).  Function: signal at magnetic-pulse-generator plug (oscilloscope)	8 (0) 30(-) 31(+)  2 (0) B-	Approx. 0 $\Omega$  > 10 V  Rectangular pulses	D03
1 1 4 1 1 2 4 1	Control unit	Motronic control unit defective.	—	—	B21

FINAL-CONTROLLING-ELEMENT AND INPUT-SIGNAL-DIAGNOSIS TEST TABLE

Flashing code	Testing of component/function	Test instructions/Test conditions	Terminals	Set values	Coordinate
1 3 1 1	Injection valves	Detach all injection-valve plugs. Connect one injection valve in each case. The connected injection valve must be heard to function.  Perform test consecutively on all injection valves.  Check injection-valve internal resistance.  Check connecting leads from control unit to injection valves for short-circuit and open-circuit.  Check Motronic-relay lead including series resistors.	—  17 14	See brief instructions	D07

## FINAL-CONTROLLING-ELEMENT AND INPUT-SIGNAL-DIAGNOSIS TEST TABLE (continued)

Flashing code	Testing of component/function	Test instructions/Test conditions	Terminals	Set values	Coordinate
1 3 2 1	Idle actuator	It must be possible to hear and feel idle actuator working. Check internal resistance of idle actuator. Check leads from control unit/ignition and starting switch to idle actuator for short-circuit and open-circuit.	4	See brief instruc.	D09
1 3 2 2	Tank-ventilation valve	It must be possible to hear and feel tank-ventilation valve working. Check internal resistance of tank-ventilation valve. Check leads from control unit/ignition and starting switch to tank-ventilation valve for short-circuit and open-circuit.	5	See brief instruc.	D11
1 3 3 2	Throttle-valve switch Idle contact	When flashing code is output, slightly open throttle valve. Flashing code goes out if signal O.K.	52 19	Approx. 0 $\Omega$	E23
1 3 3 3	Throttle-valve switch Full-load contact	When flashing code is output, open throttle valve completely. Flashing code goes out if signal O.K.	53 19	Approx. 0 $\Omega$	E28
1 3 3 4	Air-conditioning switch	When flashing code is output, switch on AC (if fitted). Flashing code goes out if signal O.K.	41 B-	Approx. battery voltage	—
1 3 3 5	Refrigerator-compressor switch	Leave AC switched on (if provided). Flashing code goes out if signals O.K.	40 B-	Approx. battery voltage	—

# SELF-DIAGNOSIS TROUBLE-SHOOTING PROGRAM ( 1 )

## SELF-DIAGNOSIS FLASHING CODE

1 1 4 1 / 1 2 4 1

The digital section (program memory) in the control unit is checked.

No flashing code?

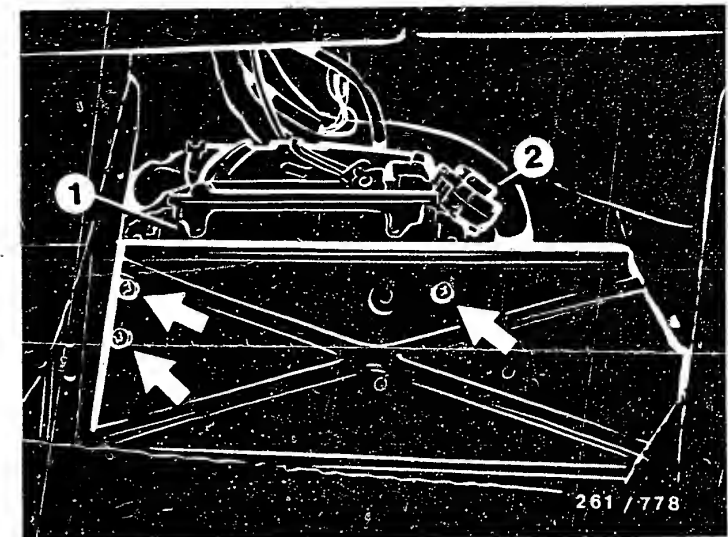
N>

Replace control unit

Return to self-diagnosis  
test table B13

B21

B22



1 = Motronic control unit  
2 = Diagnostics plug



# SELF-DIAGNOSIS TROUBLE-SHOOTING PROGRAM ( 2 )

## SELF-DIAGNOSIS FLASHING CODE

1 1 2 1 / 1 2 2 1

Check air-flow sensor with ohmmeter:

Detach air-flow-sensor plug.

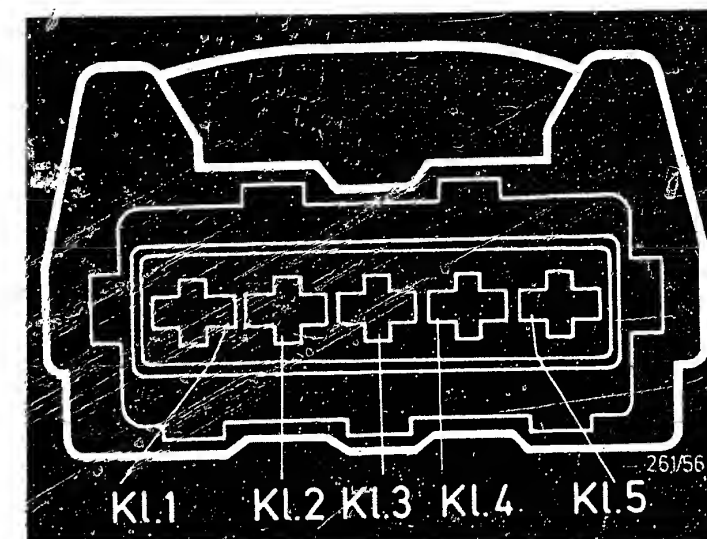
Measure resistances directly at pins of air-flow sensor:

Set values between term. 3 and term. 4 as well as between term. 2 and term. 4 see brief instructions.

Are set values attained?

N>

Replace air-flow sensor.



Top view of plug for air-flow sensor

Carry out visual inspection on plug of air-flow sensor:

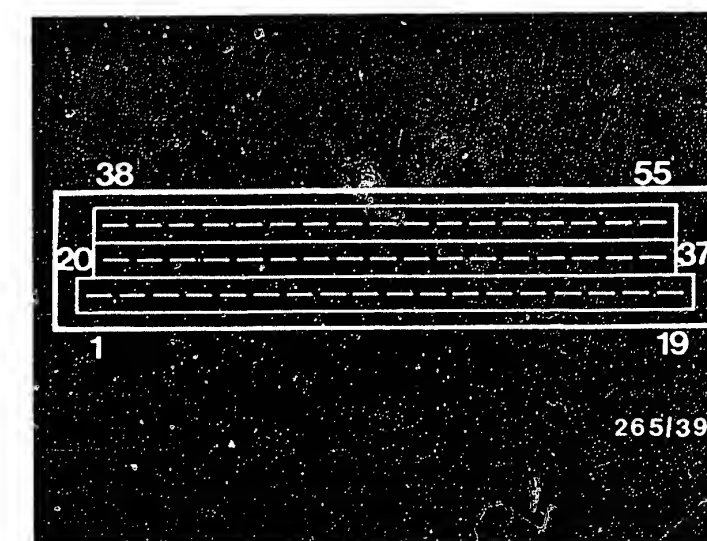
Plug inserted correctly, contacts corroded? Spring contacts must be latched in place and it must be impossible to push them back.

Is plug O.K.?

N>

Eliminate defects on plug. If necessary, replace plug or spring contacts.

Top view of 55-pin control-unit plug for Motronic wiring harness



Continued on next picture page

# SELF-DIAGNOSIS TROUBLE-SHOOTING PROGRAM ( 3 )

Test leads from air-flow sensor to control-unit plug using ohmmeter for open circuit and short circuit to ground (insulation damage).

Air-flow to control-  
sensor unit  
plug  
Term. 2 term. 7  
Term. 3 term. 12  
Term. 4 term. 26

Watch for damage to cable insulation and for loose contacts.

Leads O.K.?

N>

Eliminate contact resistances, open circuits and short circuits in leads.

Test leads to control-unit plug term.12 and term. 26 for faulty connection to each other (short circuit).

For testing, disconnect plug from air-flow sensor.

Using ohmmeter, measure between the two terminals.

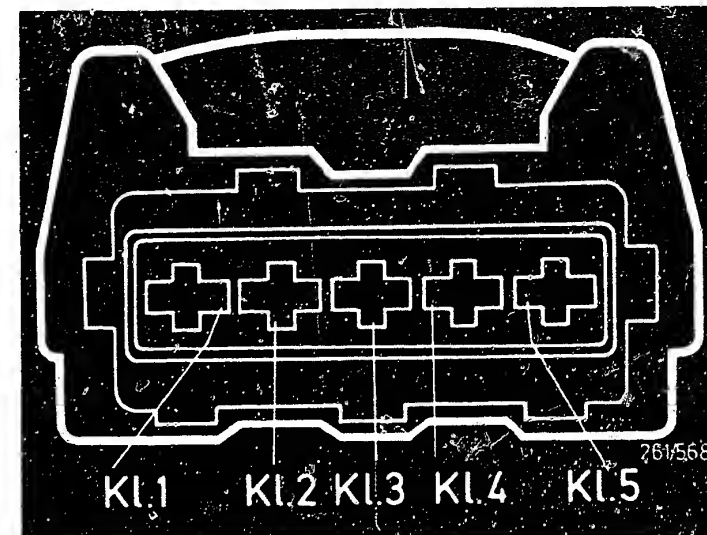
Watch for damage to cable insulation and for loose contacts.

Resistance value  
infinity  $\Omega$  ?

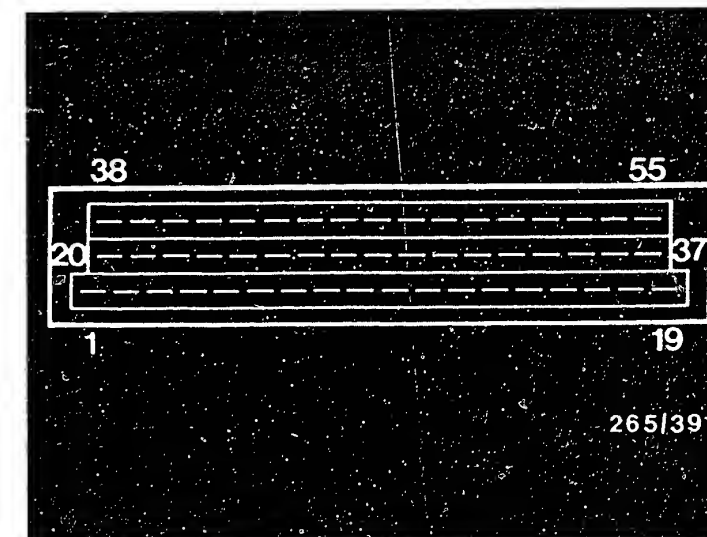
N>

Eliminate short circuit and damage to cable insulation.

Continued on next picture page



Top view of plug for air-flow sensor



Top view of 55-pin control-unit plug for Motronic wiring harness

# SELF-DIAGNOSIS TROUBLE-SHOOTING PROGRAM ( 3 ) CONTINUED ( 1 )

Additionally check leads from control unit, term. 26 and term. 7 to air-flow sensor, term. 2 and term. 4 for faulty connection to positive voltage:

Connect plug to air-flow sensor and control unit.

Push back rubber sleeve at plug of air-flow sensor.

Switch on ignition.

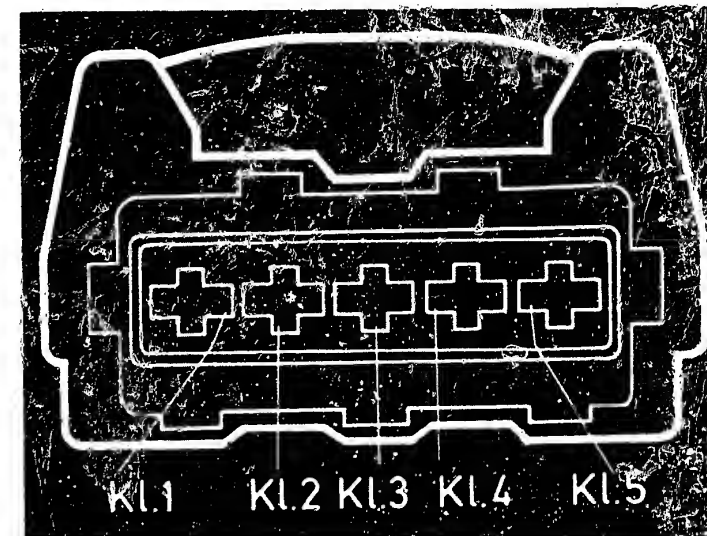
Connect voltmeter to ground and consecutively to term. 4 and term. 2 of air-flow sensor.

Set values:  
at term. 4 0 V  
at term. 2 < 4.5 V

Are set values obtained?

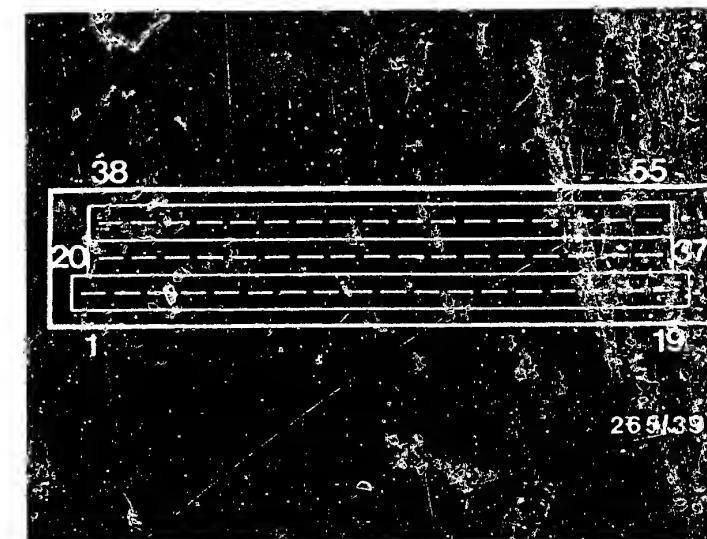
N>

- \* Visually check leads for contact (chafing points).
- \* Air-flow sensor defective.
- \* Control unit defective.



Top view of plug for air-flow sensor

Top view of 55-pin control-unit plug for Motronic wiring harness



Return to self-diagnosis test table B13

# SELF-DIAGNOSIS TROUBLE-SHOOTING PROGRAM ( 4 )

## SELF-DIAGNOSIS FLASHING CODE

1 1 2 4 / 1 2 2 4

Lambda sensor malfunctioning.

Use ohmmeter to check for open-circuit in lead from control unit, term. 28 to lambda-sensor plug connection (connection 1).

Check plug for corrosion and loose contact. It must not be possible to push back contacts. Check sensor heating.

Use ohmmeter to check lead from control unit, term. 28

to lambda sensor for short-circuit (contact) to ground. Watch out for worn cable insulation (insulation damage) and loose contact.

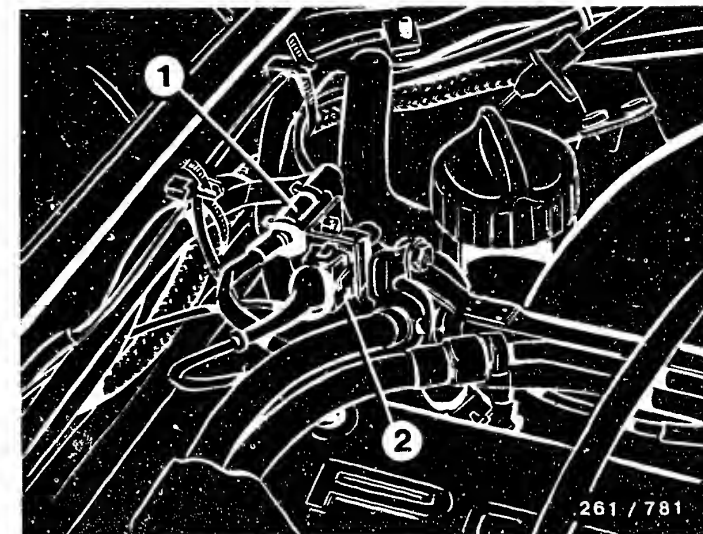
Connection between lead from control unit, term. 28 to lambda sensor and voltage-carrying lead (short-circuit with battery voltage due to insulation damage).

Watch out for worn cable insulation and loose contact.

Leads and plugs O.K. ?

N>

Repair defective lead/plug.



1 = Plug connection to lambda sensor

2 = Plug connection to engine-speed/reference-mark sensor

Replace lambda sensor. Flashing code now O.K. ? 1124 / 1224

N>

Replace control unit

Return to self-diagnosis test table B13

# SELF-DIAGNOSIS TROUBLE-SHOOTING PROGRAM ( 5)

## SELF-DIAGNOSIS FLASHING CODE

1 1 2 3 / 1 2 2 3

Lambda closed-loop control  
on rich or lean stop.

Possible causes of fault:

- Leak in air intake system  
or exhaust system
- Fuel pressure/fuel delivery  
outside tolerance
- Defective injection valves
- Extreme incorrect setting  
of idle-mixture-adjusting screw.
- Tank run empty.
- Electrical or mechanical  
defect in air-flow sensor.
- Electrical or mechanical  
defect in tank-ventilation  
valve.

Refer to trouble-shooting  
program for more details  
on testing of air-flow  
sensor and tank-ventilation valve.

Indicated items O.K.?

N>

Measure CO concentration upstream  
of catalytic converter (engine  
and cat. converter at op. temp.)  
Set value: see brief instructions

1. If mixture too lean ...

- Check air-intake system  
and exhaust system for  
leakages.  
Eliminate leakages by  
new seals or by  
tightening the hose  
clamps.
- Deposits on injection  
valves
- Fuel pressure or fuel  
delivery of electric  
fuel pump too low.  
For set values see brief  
instructions.
- Extreme adjustment of idle-  
mixture-adjustment screw.

2. If mixture too rich ...

- Fuel pressure too high
- Injection valves defective  
(leaking)
- Extreme adjustment of idle-  
mixture-adjusting screw.

N o t e :

Even if CO concentration is  
correct at idle, mixture  
deviations in other operating  
states of the engine may  
move Lambda closed-loop control  
to the stop.

Return to self-diagnosis  
test table B13



SELF-DIAGNOSIS TROUBLE-SHOOTING PROGRAM ( 6 )

V

SELF-DIAGNOSIS FLASHING CODE

1 1 1 4 / 1 2 1 4

N>

Renew temperature sensor.

Check coolant temperature sensor!

Detach temperature-sensor plug.  
Check resistance directly at pins of temperature sensor!

Set value:  
see brief instructions

Is set value attained?

Y

V

Perform visual inspection of temperature-sensor plug!

N>

Eliminate defects on plug.  
If necessary, replace plug or spring contacts.

Plug properly connected, contacts corroded? Spring contacts must be engaged and it must not be possible to push them back.

Is plug O.K.?

Y

V

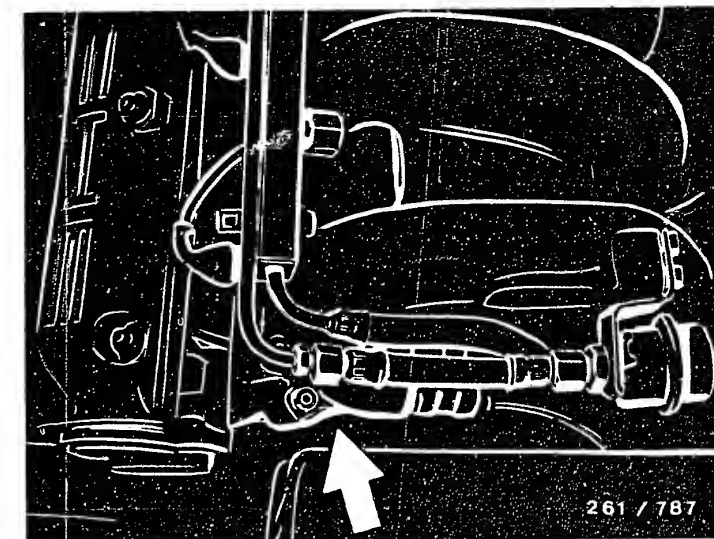
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C05

<=>

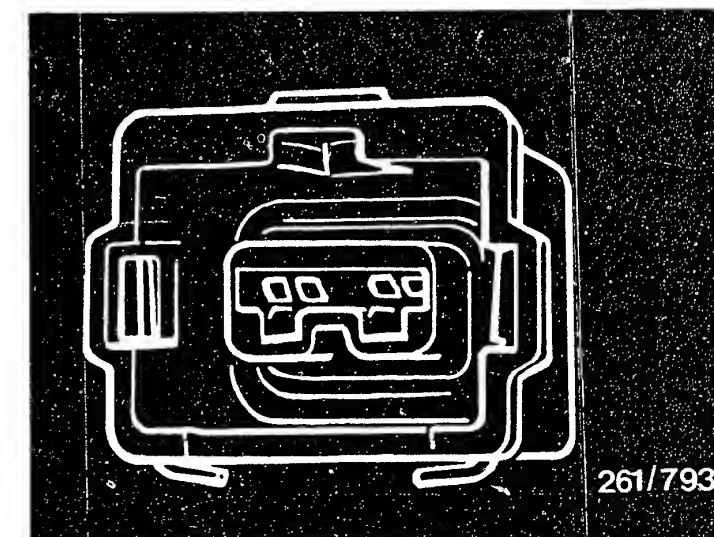
C06

<=>



Arrow = Coolant-temperature sensor

Plan view of plug of coolant-temperature sensor



SELF-DIAGNOSIS TROUBLE-SHOOTING PROGRAM ( 6 ) CONTINUED ( 1 )

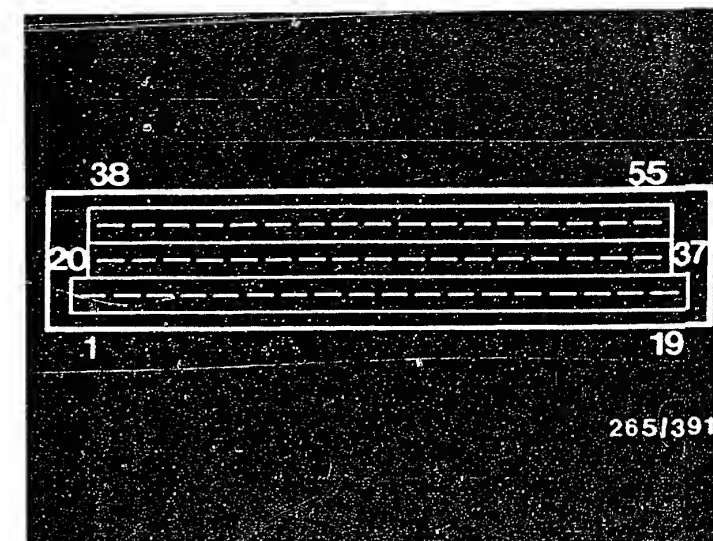
Use ohmmeter to check leads from temperature-sensor plug to control-unit plug, term. 45/term. 24 for open-circuit and short-circuit.

N>

Eliminate contact resistances, open circuits or short circuits on leads.

Leads O.K.?

Return to self-diagnosis test table B13



Top view of 55-pin control-unit plug for Motronic wiring harness

SELF-DIAGNOSIS TROUBLE-SHOOTING PROGRAM ( 7 )

SELF-DIAGNOSIS FLASHING CODE

1 1 2 5 / 1 2 2 5

Check intake-air temperature  
sensor in air-flow sensor.

Detach air-flow-sensor  
plug.

Check resistance directly  
at air-flow sensor  
between term. 1 and  
term. 4:

Set value:

See brief instructions

Is set value attained?

N>

Replace air-flow sensor.

Y

Y

Carry out visual check of  
plug of air-flow sensor.

N>

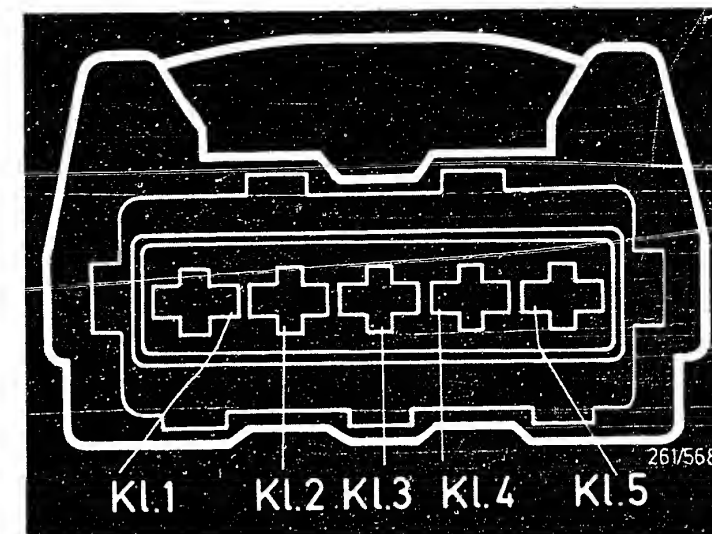
Plug inserted correctly,  
contacts corroded? Spring  
contacts must be locked in  
place and it must be  
impossible to push them back.

Is plug O.K.?

Y

Y

Continued on next picture page



Top view of plug for air-  
flow sensor

SELF-DIAGNOSIS TROUBLE-SHOOTING PROGRAM ( 7 ) CONTINUED ( 1 )

Use ohmmeter to check leads from  
air-flow-sensor plug, term. 1  
and term. 4 to control-  
unit plug, term. 44/ term. 26  
for open-circuit and  
short-circuit.

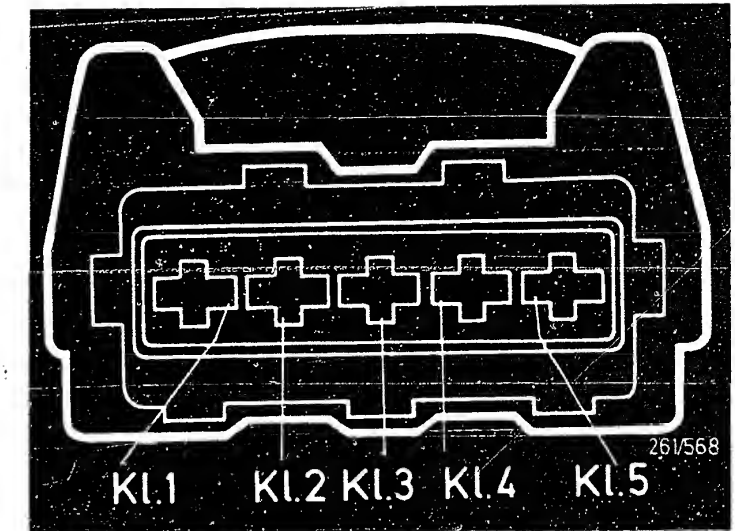
Leads O.K.?

N>

Eliminate contact resistances,  
open circuits or short circuits  
on leads.

Y

Return to self-diagnosis  
test table B13

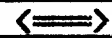


Top view of plug for air-  
flow sensor

C11



C12



# SELF-DIAGNOSIS TROUBLE-SHOOTING PROGRAM ( 8 )

## SELF-DIAGNOSIS FLASHING CODE

1 1 1 1 / 1 2 1 1

N>

Supply voltage for control unit at term. 37 with engine running < 10 V or > 16 V.

Remove handle cover from control-unit plug. Connect voltmeter to term. 37(+) and term. 24(-).

Connect control unit and allow engine to idle. Supply voltage must be between 12...14 V and may be a maximum of 1 V below battery voltage.

Voltage O.K.?

If supply voltage is too low, eliminate contact resistances at positive and negative terminals; clean central-ground terminal at engine block down to bare metal, renew plug connections if necessary. Check Motronic relay or replace it on a trial basis. Check alternator system and battery.

If supply voltage is excessive, repair alternator system.

Return to self-diagnosis test table B13

C13

<==>

C14

<==>

# SELF-DIAGNOSIS TROUBLE-SHOOTING PROGRAM ( 9 )

## SELF-DIAGNOSIS FLASHING CODE

1 1 1 2 / 1 2 1 2

N>

Idle contact in throttle-valve switch remains constantly closed or opens too late.

Check idle contact:

Detach connector at throttle-valve switch.

Throttle valve closed.

Connect ohmmeter to throttle-valve switch, term. 2 and term. 18.

Set value: 0 ohms (continuity).  
Open throttle valve somewhat:  
Reading must change to infinity ohms.

Does resistance change from 0 ohms to infinity ohms?

\*Resistance remains on 0 ohms as far as full-load stop (idle contact does not open):

Replace throttle-valve switch.

\*Idle contact does not close (reading always infinity ohms) or idle contact opens too late:

Adjust throttle-valve switch.

\*Prerequisites for throttle-valve-switch adjustment:

+Throttle valve correctly set? Its lever must make contact with the stop screw shortly prior to end position. Secure screw to prevent it turning.

+Set accelerator cable/linkage such that there is no tension. Renew if kinked.

Adjustment of throttle-valve switch:

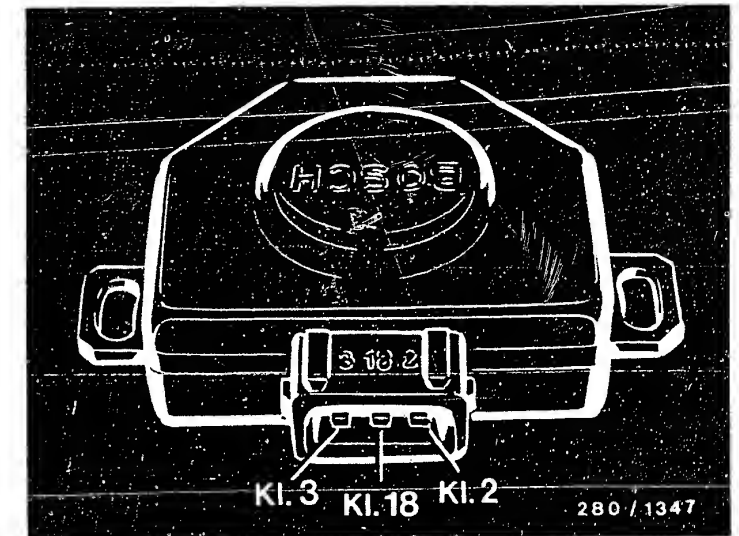
Loosen fastening screws somewhat. Connect ohmmeter to term. 2 and term. 18 of throttle-valve switch.

Turn throttle-valve switch until idle contact closes (microswitch is heard to click). Reading 0 ohms. If not, renew throttle-valve switch.

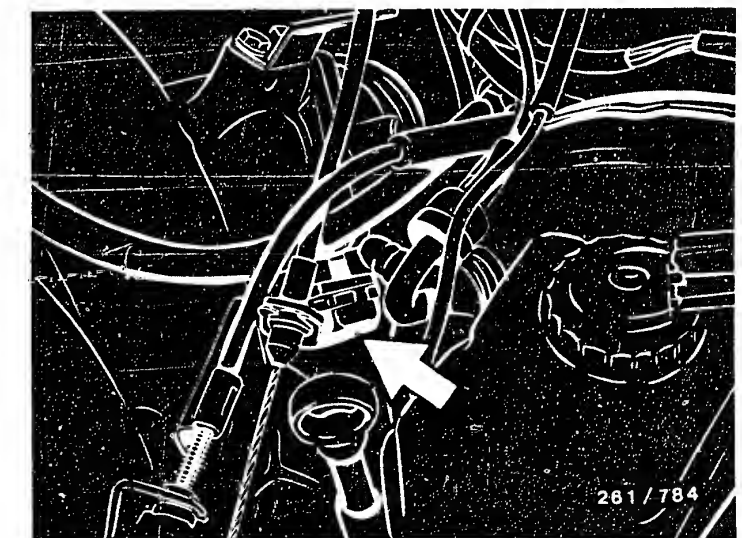
Adjustment check:

Tighten accelerator cable somewhat. Idle contact must open. (microswitch is heard to click).

Reading: infinity ohms.



Arrow = Throttle-valve switch  
(beneath the throttle-valve assembly)



Continued on next picture page

Continued on next picture page



SELF-DIAGNOSIS TROUBLE-SHOOTING PROGRAM ( 9 ) CONTINUED ( 1 )

Checking the adjustment:  
Pull slightly on throttle  
cable. Idle contact must open  
(microswitch clicks audibly).

Reading: Infinity  $\Omega$

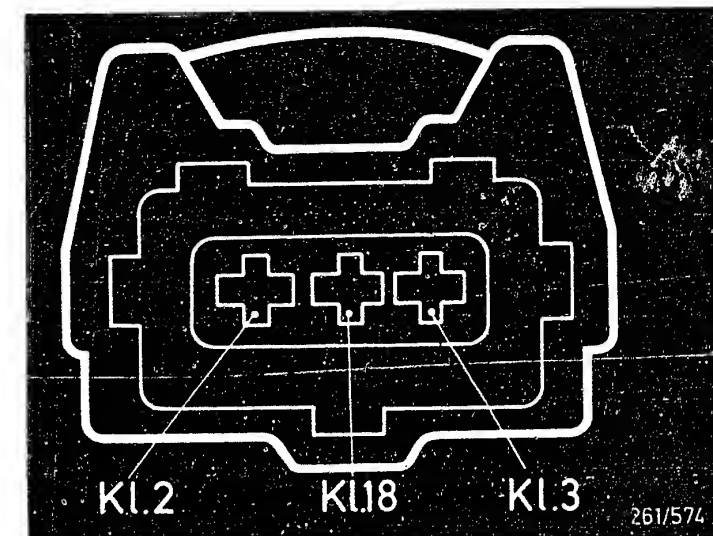
Eliminate short circuit on  
lead.

Check for short-circuit  
between leads to throttle-  
valve switch and short-  
circuit to ground:  
Detach plug from control  
unit and throttle-valve  
switch.  
Connect ohmmeter consecutively  
to throttle-valve-switch  
plug, term. 2 and term. 18  
as well as term. 2 and  
ground.  
Set value:  
infinity ohms in each case.

Watch out for worn cable  
insulation and loose contacts.

Are set values attained?

Return to self-diagnosis  
test table B13



Throttle-valve-switch plug

# SELF-DIAGNOSIS TROUBLE-SHOOTING PROGRAM (10)

## SELF-DIAGNOSIS FLASHING CODE

1 1 3 1 / 1 2 3 1

Full-load contact in throttle-valve switch remains constantly closed.

Check full-load contact:

Detach plug from throttle-valve switch.

Connect ohmmeter to throttle-valve switch, term. 3 and term. 18.

Open throttle valve as far as it will go:

The reading changes from infinity ohms to 0 ohms before reaching the full-load stop.

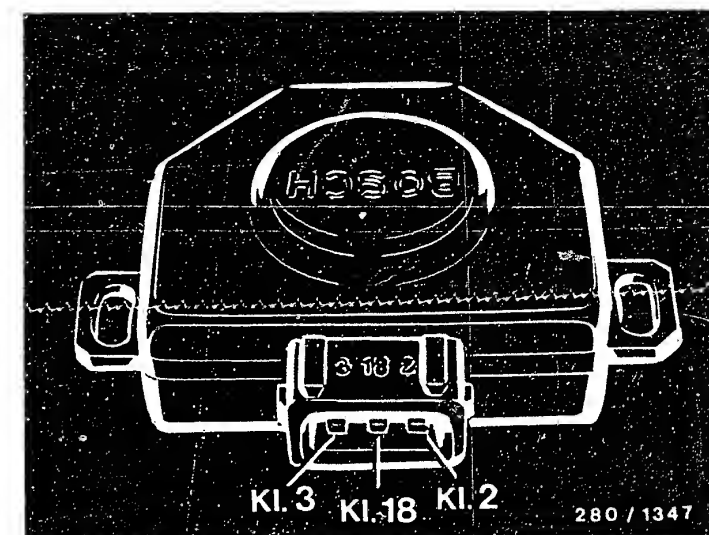
Does the reading change from infinity ohms to 0 ohms?

N>

\* Resistance value remains constantly on approx. 0  $\Omega$  (full-load contact does not open):  
Replace throttle-valve switch.

\* Full-load contact does not close (reading remains constantly on infinity  $\Omega$ ):  
Check whether throttle valve is mechanically capable of opening fully.  
If mechanical system is O.K., replace throttle-valve switch.

N o t e :  
Full-load contact cannot be adjusted. If idle contact is correctly set, then the setting of the full-load contact is likewise correct.



Arrow = Throttle-valve switch  
(beneath the throttle-valve assembly)



Continued on next picture page

SELF-DIAGNOSIS TROUBLE-SHOOTING PROGRAM (10) CONTINUED ( 1 )

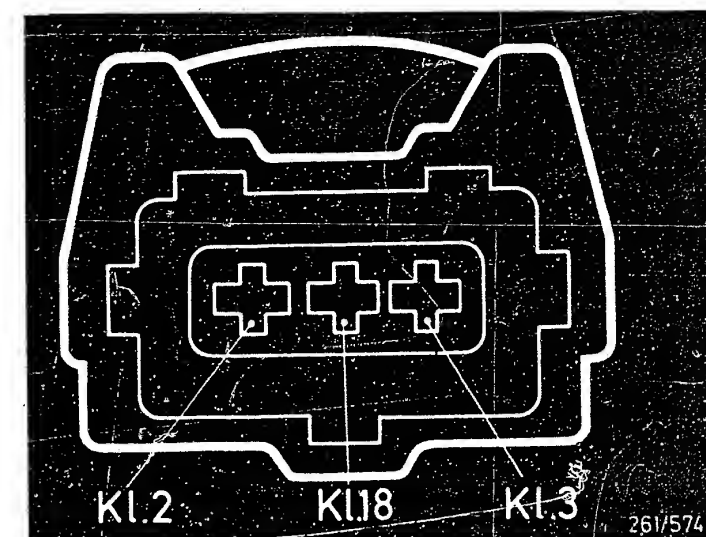
V  
\*Check for short-circuit  
between leads to throttle-  
valve switch and short-  
circuit to ground:  
Detach plug from control unit  
and throttle-valve  
switch.  
Connect ohmmeter consecutively  
to throttle-valve-switch  
plug, term. 3 and term. 18  
as well as term. 3 and ground.

Set value:  
infinity  $\Omega$  in each case

Watch out for worn cable  
insulation and loose contacts.

Are set values attained?

N> Eliminate short circuit on  
lead.



Throttle-valve-switch plug

V  
Return to self-diagnosis  
test table B13

# SELF-DIAGNOSIS TROUBLE-SHOOTING PROGRAM (11)

## SELF-DIAGNOSIS FLASHING CODE

1 1 3 1 / 1 2 3 1

No or faulty signal from  
knock sensor 1

### Visual inspection

Disconnect knock-sensor  
plug connection.  
Check contacts of plug  
and socket (top picture, arrows)  
for oxidation.

Visual inspection O.K.?

N>

Eliminate oxidation.

Detach control-unit plug  
and plug of knock sensor; connect  
ohmmeter to:

Control-unit plug	Knock-sensor plug
term. 1	term. 1
term. 11	term. 2

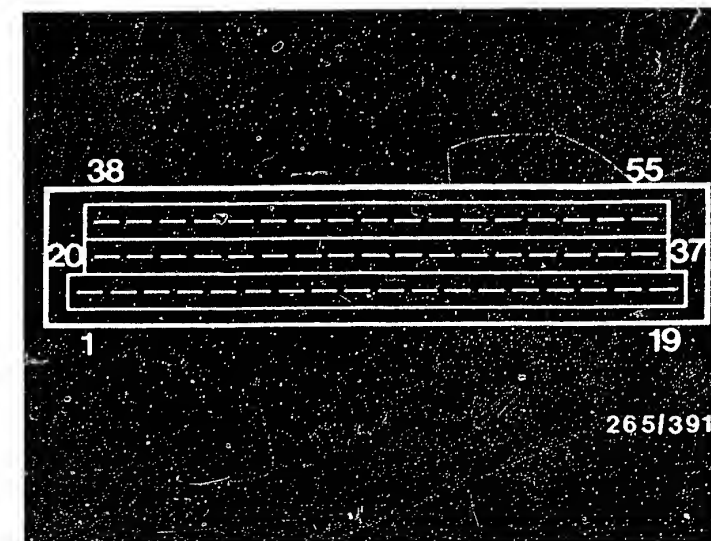
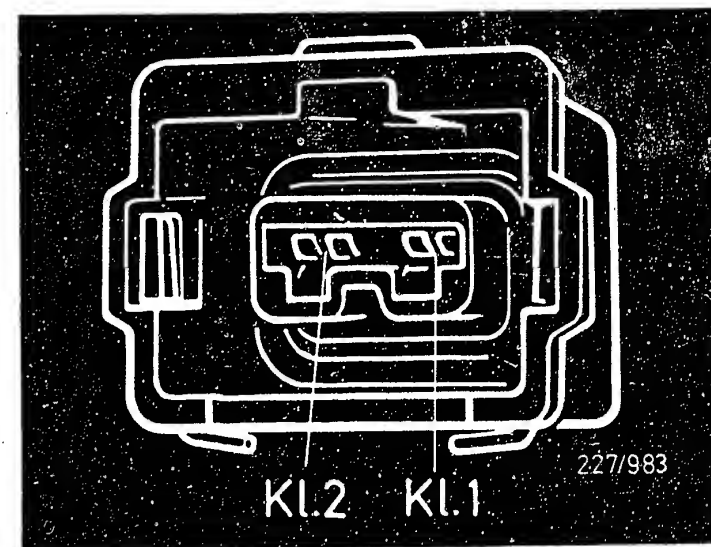
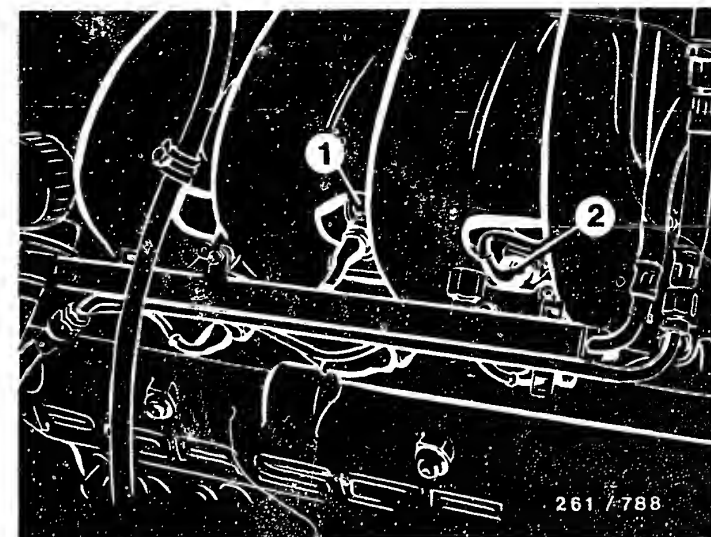
Ohmmeter must indicate  
continuity.

Resistance values O.K.?

N>

Eliminate open circuit in  
respective lead.

Continued on next picture page



SELF-DIAGNOSIS TROUBLE-SHOOTING PROGRAM (11) CONTINUED ( 1 )

Check leads to knock sensor for short-circuit between leads 1 and for short-circuit to ground:

N>

Eliminate short circuit on lead.

Plugs of control unit and knock sens. 1 have already been detached.

Connect ohmmeter consecutively to knock-sensor plug, term. 1 and term. 2 as well as term. 1 and ground.

Set value:  
infinity  $\Omega$  in each case  
Watch out for worn cable insulation and loose contacts.

Are set values attained?

Renew knock sensor.  
(Note tightening torque, see brief instructions).

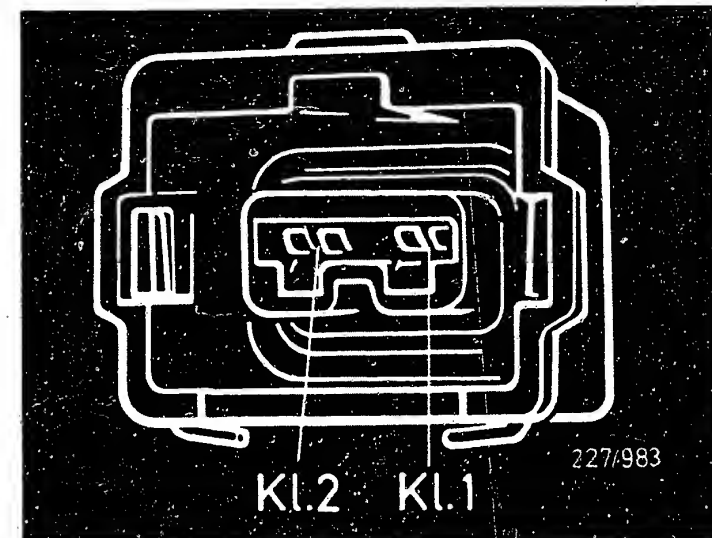
N>

Renew control unit.

Activate self-diagnosis.  
"Old" knock sensor is defective, if flashing code 1131 / 1231 is now no longer indicated.

Self-diagnosis O.K.?

Return to self-diagnosis test table B13



# SELF-DIAGNOSIS TROUBLE-SHOOTING PROGRAM (12)

## SELF-DIAGNOSIS FLASHING CODE

1 1 3 2 / 1 2 3 2

No or faulty signal from  
knock sensor 2

### Visual inspection

Disconnect knock-sensor  
plug connection.  
Check contacts of plug  
and socket (top picture, arrows)  
for oxidation.

Visual inspection O.K.?

N>

Eliminate open circuit.

Detach control-unit plug  
and plug of knock sensor; connect  
ohmmeter to:

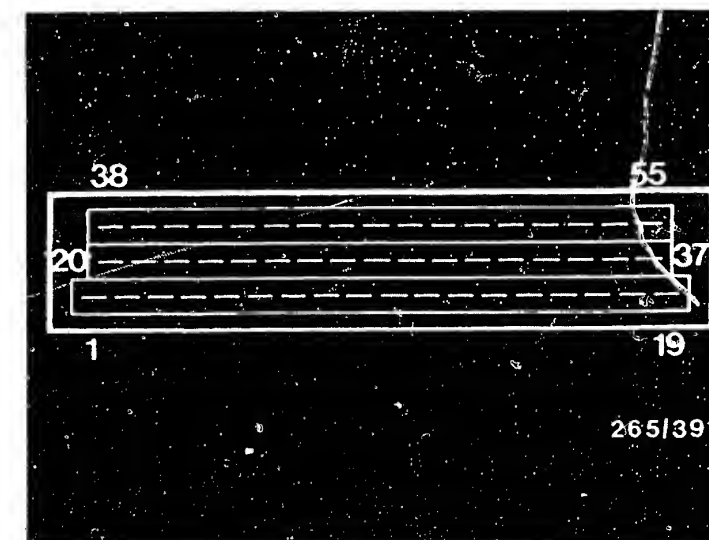
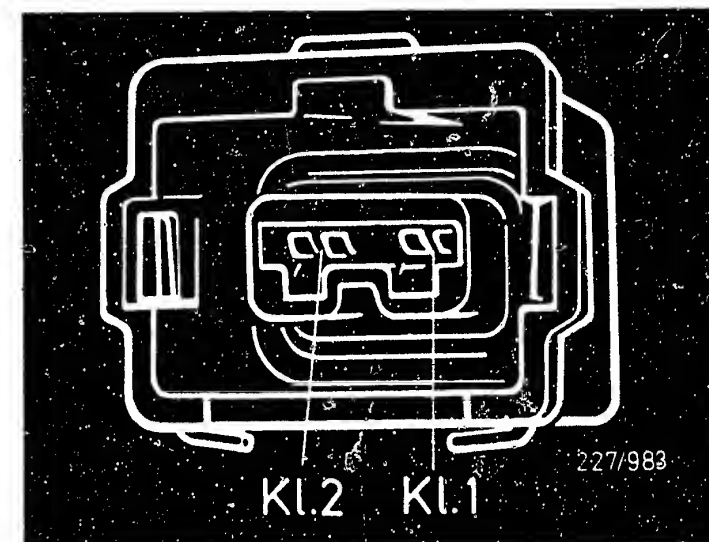
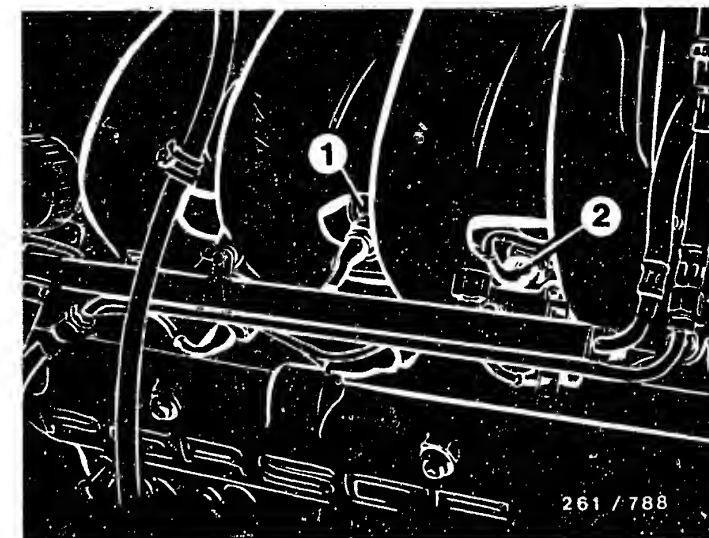
Control-unit plug	Knock-sensor plug
term. 2	term. 1
term. 29	term. 2

Ohmmeter must indicate  
continuity.

Resistance values O.K.?

N>

Eliminate open circuit in  
respective lead.



Continued on next picture page



SELF-DIAGNOSIS TROUBLE-SHOOTING PROGRAM (12) CONTINUED ( 1)

Check leads to knock sensor for short-circuit between leads 2 and for short-circuit to ground:

Plugs of control unit and knock sens. 2 have already been detached.

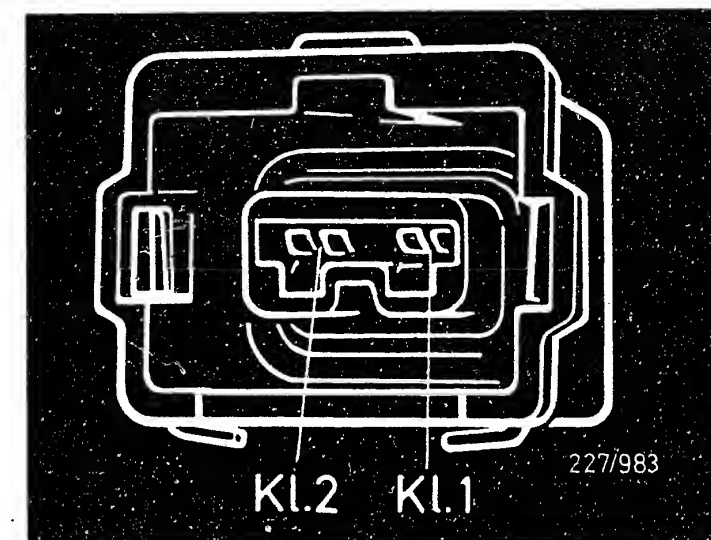
Connect ohmmeter consecutively to knock-sensor plug, term. 1 and term. 2 as well as term. 1 and ground.

Set value:  
infinity  $\Omega$  in each case  
Watch out for worn cable insulation and loose contacts.

Are set values attained?

N>

Eliminate short circuit on lead.



Renew knock sensor.  
(Note tightening torque, see brief instructions).

Activate self-diagnosis.  
"Old" knock sensor is defective, if flashing code 1132 / 1232 is now no longer indicated.

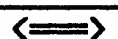
Self-diagnosis O.K.?

N>

Renew control unit.

Return to self-diagnosis test table E13

D01



D02



# SELF-DIAGNOSIS TROUBLE-SHOOTING PROGRAM (13)

## SELF-DIAGNOSIS FLASHING CODE

1 1 3 4 / 1 2 3 4

No or faulty signal from magnetic pulse generator (Hall generator).

Detach control-unit plug, detach magnetic-pulse-generator plug connection. Check following leads for continuity:

From control-unit plug	To plug connection
term. 8	term. 2
term. 30	term. 3
term. 31	term. 1

Ohmmeter must indicate approx. 0  $\Omega$  in each case. Leads O.K., continuity?

N>

Eliminate open circuit.

Check magnetic-pulse-generator voltage supply.

Connect control unit and magnetic pulse generator.

Push back rubber sleeve of plug.

Connect voltmeter to term. 1 (+) and term. 3 (-). Switch on ignition. Voltmeter reading must be at least 10 V.

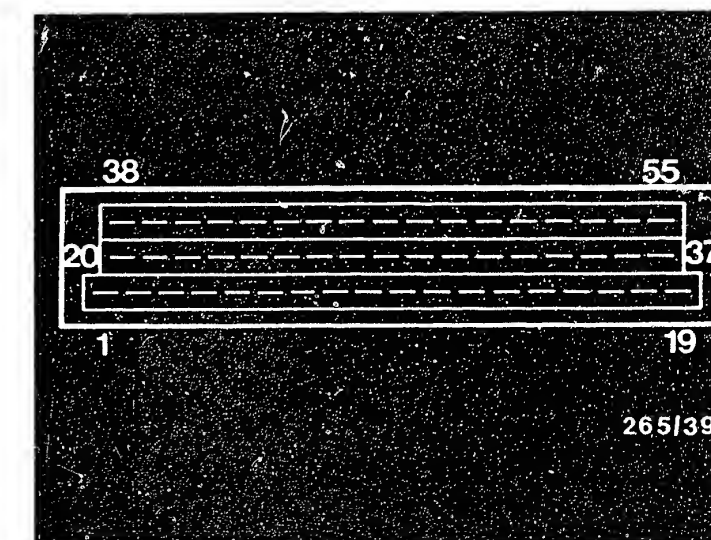
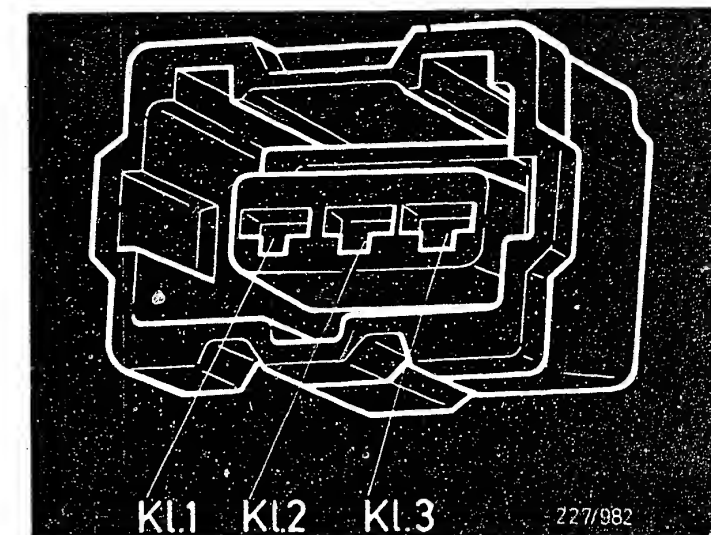
Voltage reading O.K.?

N>

Detach magnetic-pulse-generator plug.

Renew control unit if voltage value does not change.

Considerable increase in voltage:  
Renew magnetic pulse generator.



Continued on next picture page

SELF-DIAGNOSIS TROUBLE-SHOOTING PROGRAM (13) CONTINUED ( 1)

Check function of magnetic pulse generator.

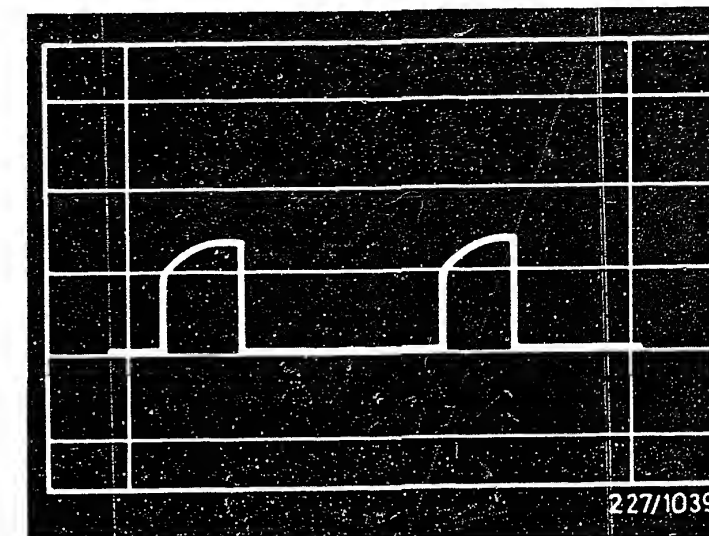
N>

Renew magnetic pulse generator.

Connect oscilloscope special input in accordance with operating instructions to magnetic-pulse-generator plug, term. 2 (0) and vehicle ground.

Start engine, see picture below for measurement signal.

Measurement signal O.K.?



Return to self-diagnosis test table B13

D05

<==>

D06

<==

# FINAL-CONTROLLING-ELEMENT DIAGNOSIS - TROUBLE-SHOOTING PROGRAM ( 1 )

## FINAL-CONTROLLING-ELEMENT DIAGNOSIS FLASHING CODE 1 3 1 1

Detach plugs from all injection valves.  
Only re-connect one injection valve in each case.  
The connected injection valve must function audibly/perceptibly.  
Perform test consecutively on all injection valves.

Note:  
Despite the short actuation frequency, starting problems may be encountered after this test, since some fuel remains in the fuel distributor.

Final-controlling-element diag. O.K.?

N>

Check injection-valve internal resistance.  
See brief instructions for set value.  
Renew defective injection valves.

Check for continuity in lead from control unit, term. 17 to injection valves and from term. 14 to vehicle ground; eliminate open-circuits.

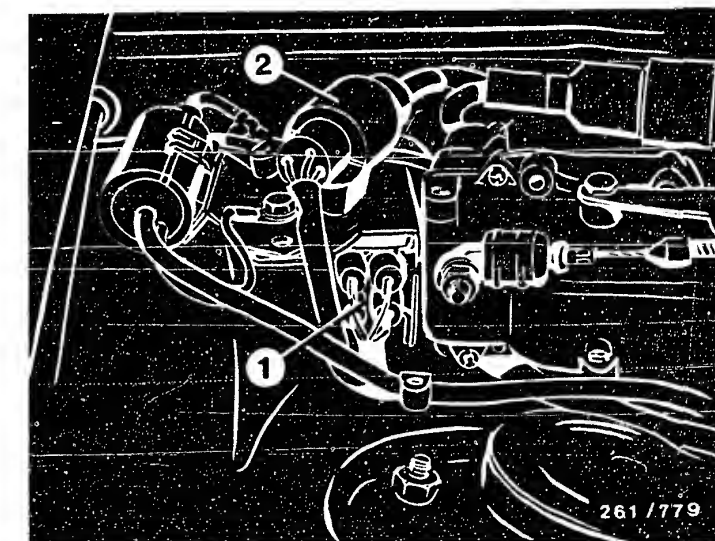
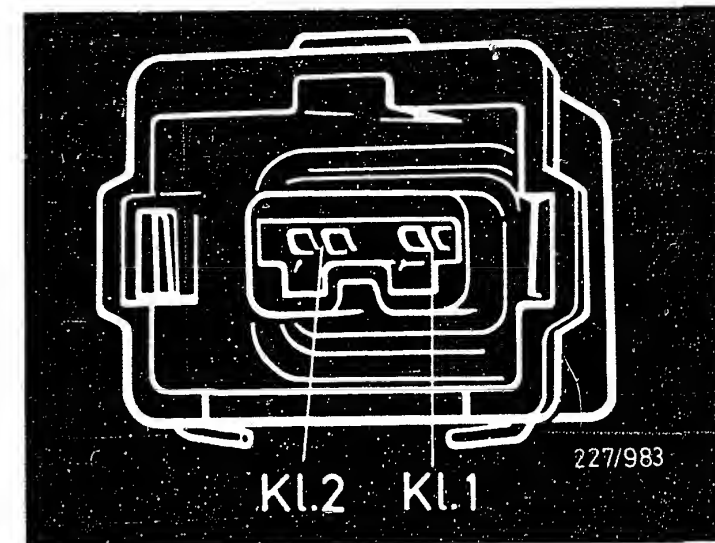
Connect voltmeter to injection-valve plug, term. 2 and vehicle ground.  
Switch on ignition.  
Set value: approx. battery voltage

If there is no voltage indicated, check for continuity in lead from injection valves via series resistors and engine plug to Motronic relay, term. 87.

Check series resistors:  
Set value: 5...7  $\Omega$  per series resistor.

Eliminate open-circuits, renew defective parts.

Renew Motronic control unit if there were no open-circuits and all tested parts were O.K.



Return to final-controlling-element diagnosis - test table (B17)

# FINAL-CONTROLLING-ELEMENT DIAGNOSIS - TROUBLE-SHOOTING PROGRAM ( 2 )

FINAL-CONTROLLING-ELEMENT DIAGNOSIS  
FLASHING CODE 1 3 2 1

Idle actuator must move audibly  
from stop to stop in approx. 1s.

Idle-actuator function  
O.K.?

N>

\*Measure winding resistance  
directly at idle actuator:

SET VALUES:  
see brief instructions

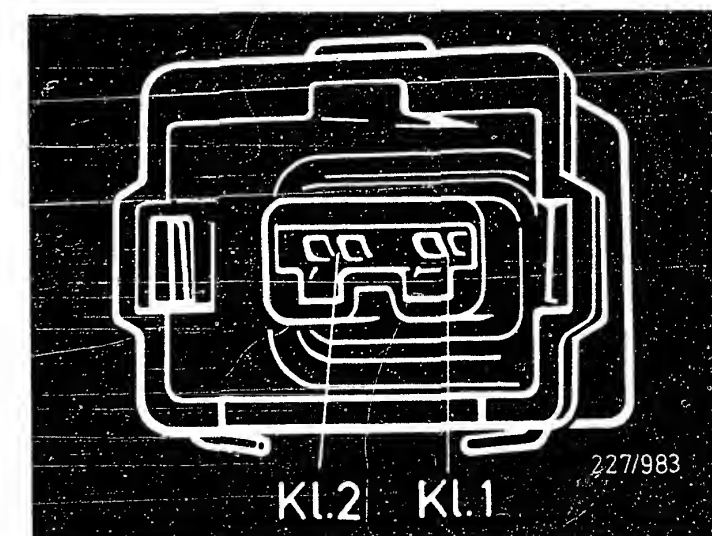
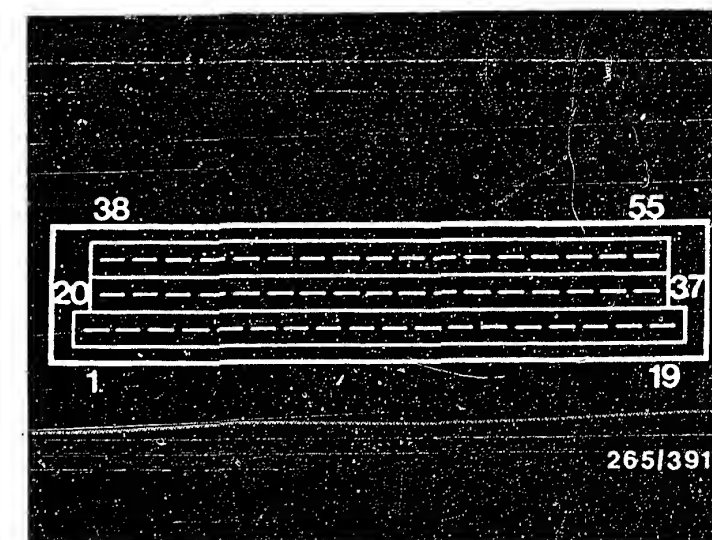
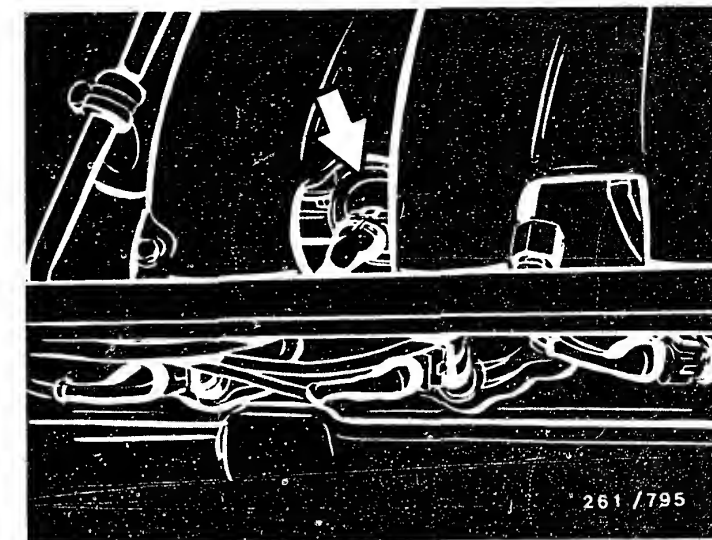
\*Check for continuity in  
leads from control unit, term. 4  
to idle actuator, term. 1  
as well as in lead from  
idle actuator, term. 2 to  
Motronic relay, term. 87.  
Check plug for corrosion  
and loose contact.  
It must not be possible to  
push back contacts.

\*Slide of idle actuator must  
neither stick nor catch.

Eliminate open-circuits,  
renew defective parts.

Renew Motronic control unit  
if there were no open-circuits  
and all tested parts were O.K.

Return to final-controlling-element  
diagnosis - test table (B19)





# FINAL-CONTROLLING-ELEMENT DIAGNOSIS - TROUBLE-SHOOTING PROGRAM ( 3 )

FINAL-CONTROLLING-ELEMENT DIAGNOSIS  
FLASHING CODE 1 3 2 2

Tank-ventilation valve  
must be heard or felt to function.

Final-controlling-element diag. O.K.?

N>

Measure resistance directly  
at pins of tank-ventilation  
valve.

Set value: see brief instructions.

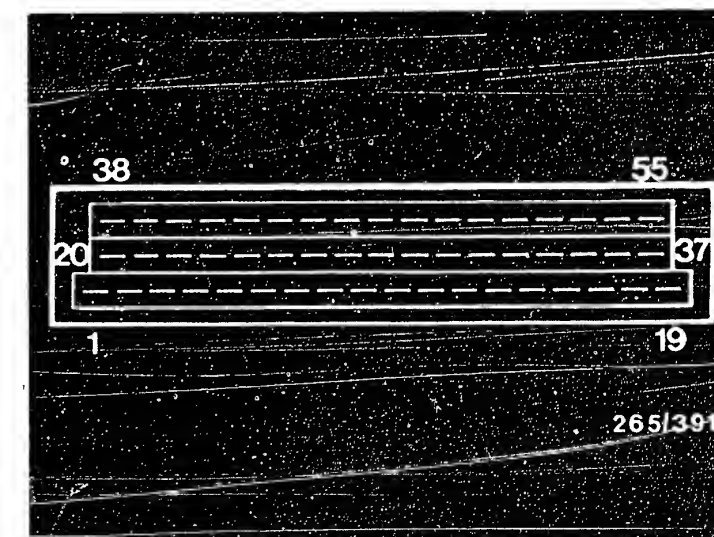
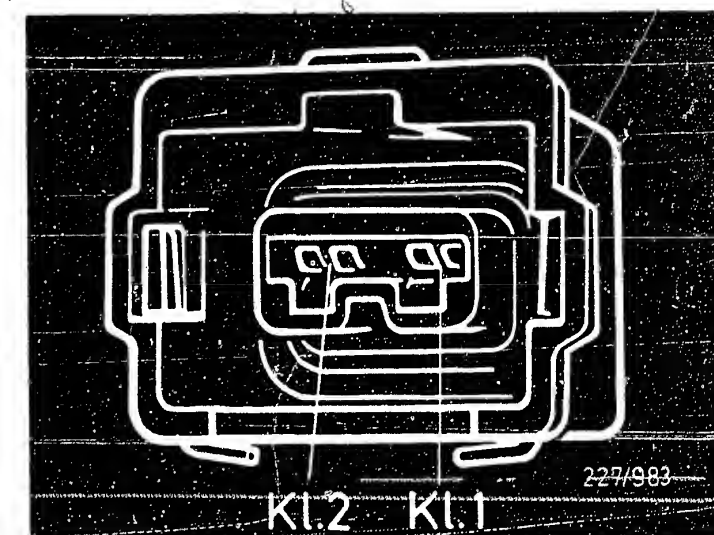
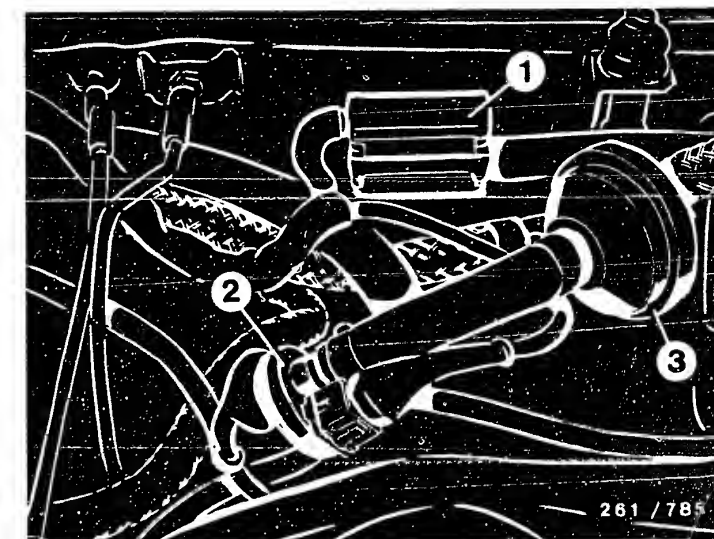
Check for continuity in lead  
from control unit, term. 5 to  
tank-ventilation valve, term. 2.

Check for continuity in lead  
from Motronic relay, term. 87  
via engine plug, term. 2 to tank-  
ventilation valve, term. 1.

Check Motronic relay.

Eliminate open-circuits,  
renew defective parts.

Renew control unit if there  
was no open-circuit and relay  
O.K.



Return to final-controlling-element  
diagnosis - test table (B19)

D11

<=>

D12

<=>



# TROUBLE-SHOOTING PROGRAM ( 1 )

Check control-unit voltage supply.

Switch off ignition, detach control-unit plug.  
Connect voltmeter to term. 37(+), and term. 24(-).

Switch on ignition.

SET VALUE: Battery voltage

Is set value attained?

N>

Switch off ignition.  
Check following leads for continuity:

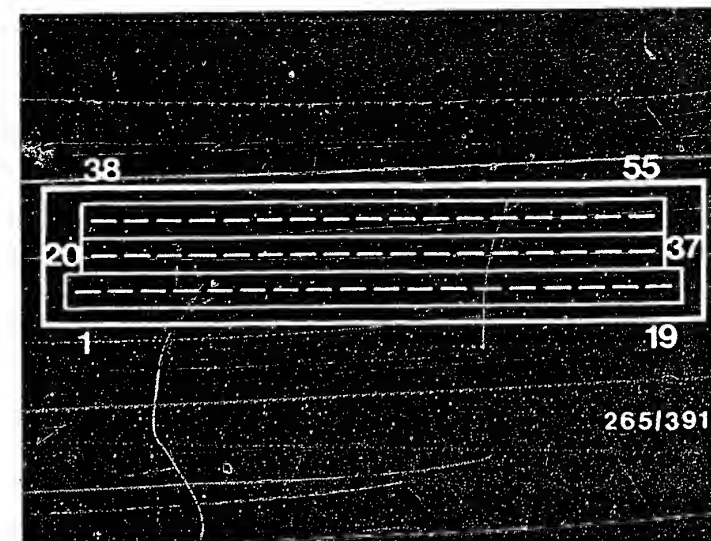
1. From control-unit plug, term. 24 to central ground.
2. From control-unit plug, term. 37 via engine plug, term. 3 to Motronic relay, term. 87.

Measure voltages at Motronic relay:

1. Detach relay, connect voltmeter to relay frame, term. 86(+) and term. 85(-). Switch on ignition, voltmeter must indicate approx. battery voltage. If not, check for continuity in lead from ignition and starting switch via alarm-system control unit (if provided) to relay, term. 86 and from relay, term. 85 to vehicle ground.
2. Connect voltmeter to relay, term. 30(+) and term. 85(-). Switch on ignition, voltmeter must indicate approx. battery voltage. If not, check for continuity in lead from relay frame, term. 30 to battery.

3. Check Motronic relay.  
With ignition switched on, relay is felt to switch when detaching and attaching. If switching cannot be felt, renew Motronic relay.

Return to trouble-shooting chart B03



265/391

Test internal resistance of engine-speed/ref.-mark sensor:

Detach plug-in connection to sensor.  
Connect ohmmeter at plug to sensor between term.1 and term.2.

Set value: see brief instructions

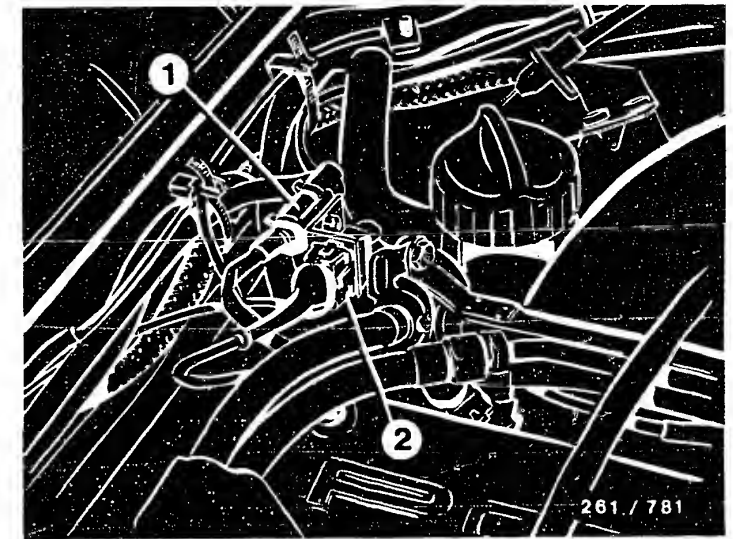
Is set value obtained?

Sensor defective; replace.

Directions for replacement:

Unscrew fastening screw and pull out sensor.  
This may be easier by rotating sensor and/or using screwdriver.

Do not take new sensor from protective sleeve until shortly before installation. Before fitting the sensor, make sure that no metallic parts are attached to the sensor (sensors contain permanent magnets). Grease sensor with Longterm 2 and press into hole by hand to the stop. Do not use force and do not hammer! Pay attention to correct fitting of spring contacts in the plug. It must be impossible to push back spring contacts and they must be free of corrosion. Plug-in connection must latch in place.



- 1 = Plug connection to lamba sensor  
2 = Plug connection to engine-speed/reference-mark sensor

Continued on next picture page

TROUBLE-SHOOTING PROGRAM ( 2 ) CONTINUED ( 1 )

Check engine-speed/reference-  
mark sensor for short circuit  
to ground (insulation damage):

Disconnect plug from control  
unit.  
Sensor plug connector  
connected.  
Connect ohmmeter to control-  
unit plug term. 47 and  
ground.

Set value: Infinity  $\Omega$

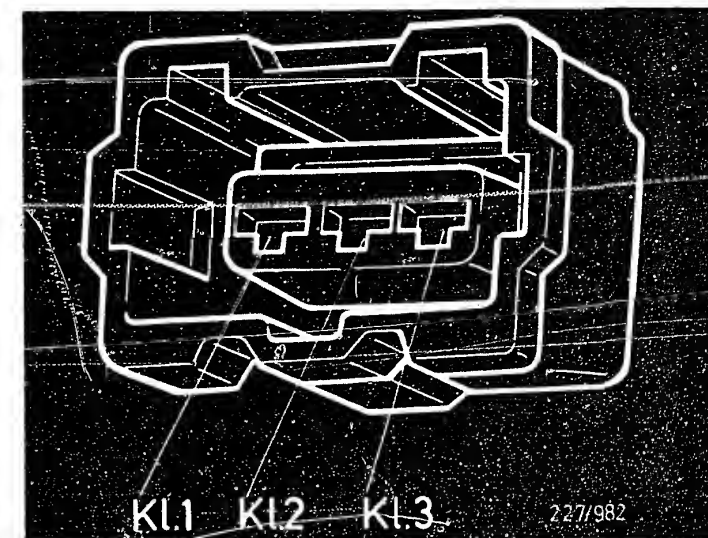
Watch for worn insulation and  
loose contacts.

Set value obtained?

N>

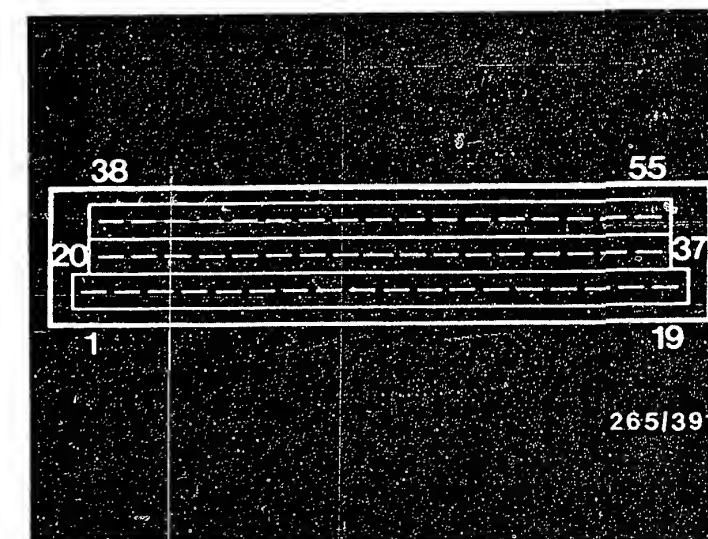
Set value less than 1 M  $\Omega$  :  
Repair defective lead from  
control unit term. 47 or  
term. 48 to sensor plug.

If sensor lead defective,  
replace sensor.



Top view of engine-speed-  
sensor plug

Top view of 55-pin control-  
unit plug for Motronic  
wiring harness



Continued on next picture page

V

Check the following leads for open circuit with ohmmeter:

N&gt;

From control-unit plug term. 47 to sensor plug connector term. 1 and from control-unit plug term. 48 to sensor plug connector term. 2.

Set values: 0  $\Omega$

Check plug for corrosion and loose contact.  
Contacts must not allow themselves to be pushed back.

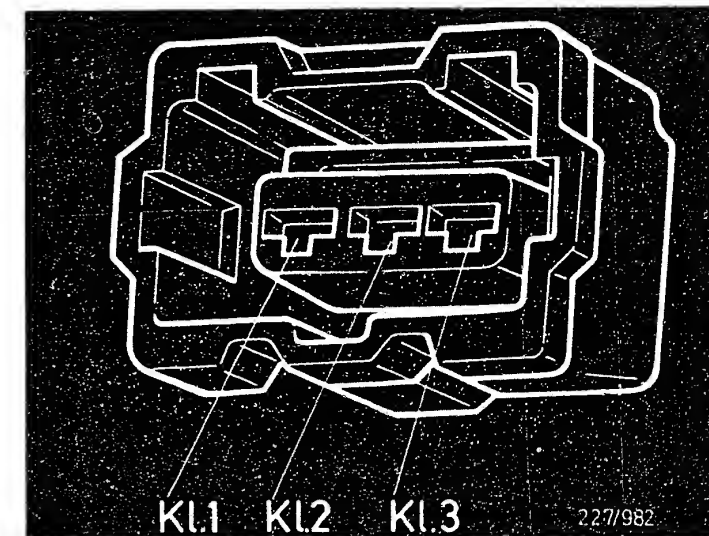
Set values obtained?  
Contacts O.K.?

Y

V

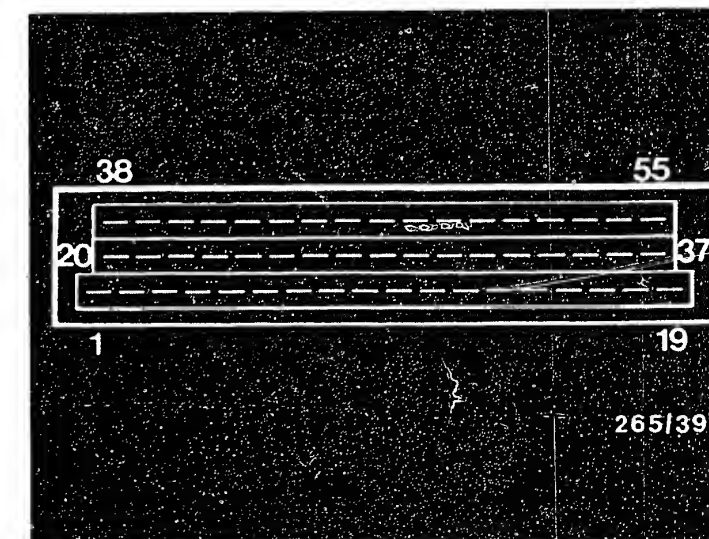
Continued on next picture page

Repair defective lead and/or plug.



Top view of engine-speed-sensor plug

Top view of 55-pin control-unit plug for Motronic wiring harness



Check signal from engine-speed/  
reference-mark sensor.

Take apart sensor plug  
connector.

Set motortester to special  
input.

Lever at left-hand stop  
(calibrated voltage range).

Connect special cable to plug  
of sensor:

Red tester clamp to term. 1(+)  
of sensor plug, black tester  
clamp to term. 2 (negative,  
center contact).

Start engine.

Set value: See top picture.

Read off voltage.

**N o t e:**

With the reference-mark  
signal, the negative amplitude  
must appear first.

Signal O.K.?

N>

1. No signal or signal  
too small:

Measuring leads incorrectly  
connected.

Cranking speed less than  
200 min<sup>-1</sup>:  
Charge battery.

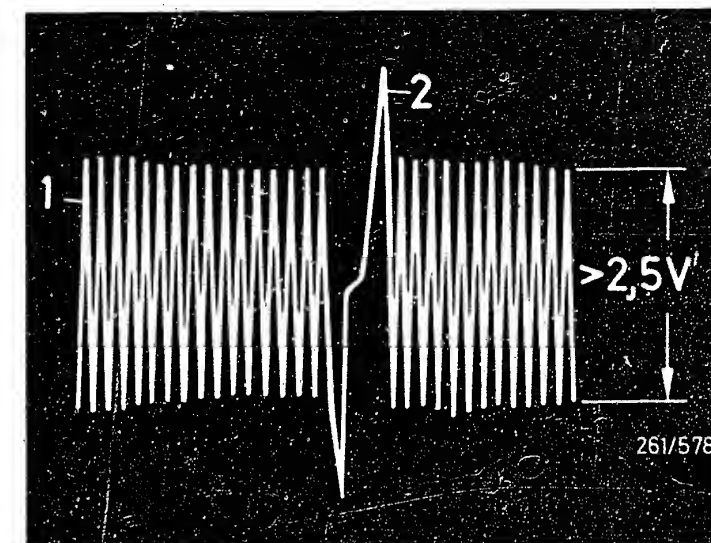
Sensor air gap too big.  
Nominal air gap:  
0,8 mm ± 0.3.

Sensor mechanically defective,  
replace.

2. Incorrect signal:

Ring gear defective.  
Note: Reference-mark signal  
is formed by several missing  
teeth in succession.

Positive amplitude appearing  
first: measuring leads  
incorrectly connected or sensor  
leads to control unit mixed  
up.  
Rectify in accordance with  
circuit diagram.



1 = Engine-speed signal  
2 = Reference-mark signal

Return to trouble-shooting chart  
B03

Continued on next picture page

V

Sensor defective; replace.

Directions for replacement:

Unscrew fastening screw and pull out sensor. This may be easier by rotating sensor and/or using screwdriver.

Do not take new sensor from protective sleeve until shortly before installation. Before fitting the sensor, make sure that no metallic parts are attached to the sensor (sensors contain permanent magnets). Grease sensor with Longterm 2 and press into hole by hand to the stop. Do not use force and do not hammer! Pay attention to correct fitting of spring contacts in the plug. It must be impossible to push back spring contacts and they must be free of corrosion. Plug-in connection must latch in place.



# TROUBLE-SHOOTING PROGRAM ( 3 )

Check fuel pressure with engine not running.

Measure pressure ahead of pressure regulator. Measurement point: fuel-distributor pipe beneath cap nut (see top picture).

Unscrew cap nut.

**CAUTION!**

The ball in the nut may drop out. Catch any fuel which emerges; it must not be allowed to come into contact with hot engine components.

Connect pressure gauge KDJE-P100 (screw connection M 12 x 1.5).

Make sure connection does not leak. Fit jumper between term. 87 and term. 30 in connection frame of Motronic relay. Electric fuel pump must run.

Fuel pressure  
SET VALUE: see brief instructions

Is set value attained?

N>

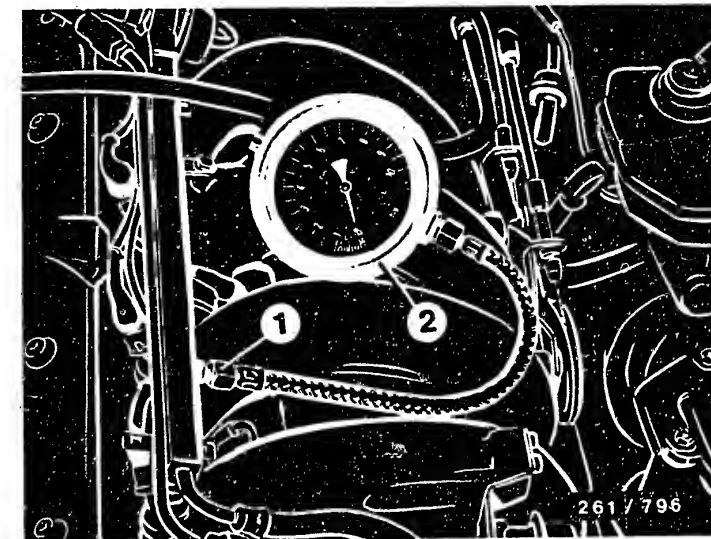
\*Check pump fuse no. 34.  
\*Measure voltage at detached plugs of electric fuel pump.  
Reading: approx. U B

No voltage:  
Check leads from plug to Motronic relay, term. 87b as well as pump ground lead.  
Positive lead is routed via central-electrics console.

Voltage present:  
Measure resistance of fuel pump.

Set value: approx. 1 Ω

Perform hydraulic check on pressure regulator and fuel pump (see next picture page).



1 = Test connection for fuel pressure  
2 = Pressure gauge

Continued on next picture page

Continued on next picture page

↓

Set value not reached:

\*Slowly pinch off fuel return line.

Caution: pressure must not rise above 6 bar.

If pressure rises above 5 bar  
→ replace pressure regulator.

In case of O ring sealing, use new O rings. Lightly grease with silicone grease (Ft 2 v 1).

Pressure does not rise sufficiently: fuel pump defective.

\*Fuel filter very dirty  
→ replace.

\*Fuel delivery line or pressure damper (if applicable) clogged  
→ replace.

\*Strainer in tank clogged.  
Corrosion in tank.

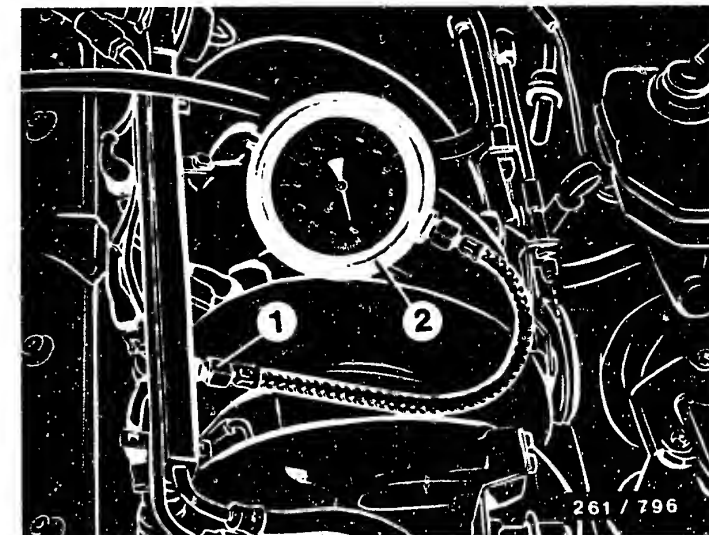
Set value exceeded:

Loosen fuel return hose from pressure regulator. Mount test hose on pressure regulator and lead into a 1.5l measuring glass.

Is set value now obtained?

\*If yes, fuel return line clogged or pinched → replace.

\*If not, pressure regulator defective → replace.



↓

Continued on next picture page

# TROUBLE-SHOOTING PROGRAM ( 3 ) CONTINUED ( 2 )

Check fuel delivery.

Measure electric-fuel-pump delivery under pressure. Measurement point at return, downstream of pressure regulator.

Detach fuel return hose from pressure regulator.  
Attach test hose to pressure regulator and route hose into a 1.5 l measuring jug.  
Detach Motronic relay.  
Fit jumper in both term. 87 and term. 30 of connection frame.  
Switch on ignition.  
The electric fuel pump must run. Measurement time 30 s.

Fuel delivery  
SET VALUE: See brief instructions

Is set value attained?

After completion of test:

Remove cable link and insert Motronic relay in connection base.

Disassemble test hose and screw on cap nut with ball again.  
Pay attention to leakages.

Return to trouble-shooting chart B03

N>

\*Fuel filter heavily soiled, replace.

\*Fuel pressure line or pressure damper (if fitted) blocked, replace.

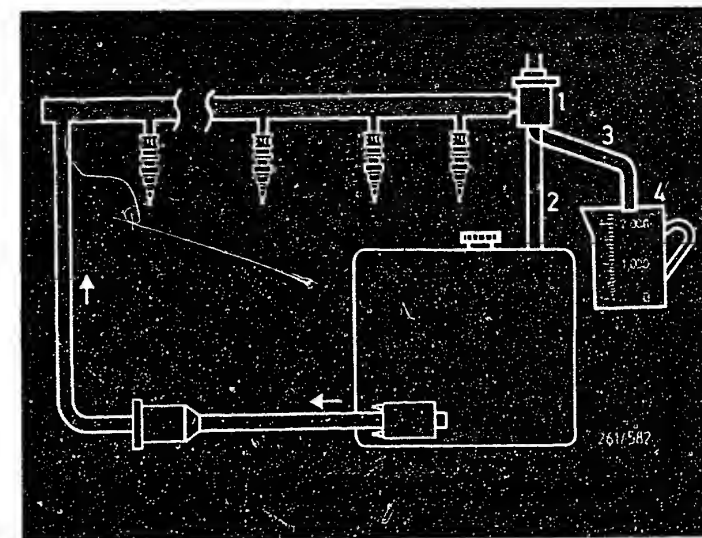
\*Voltage at electric fuel pump with engine running, min. 12 V. If not, clean contacts, remedy poor ground connection, replace leads.

\*Check pre-supply pump (if fitted). Measuring point: Line between the pumps. Delivery quantity must be at least 10% greater than that of electric fuel pump. If not, replace pre-supply pump.

\*If fuel-pump output is too low, replace electric fuel pump, clean connecting points before separation to prevent dirt from entering fuel system. In-tank electric fuel pumps are accessible via a plug on the tank.

\*If electric fuel pump is noisy (vapor bubbles), suction line restricted or kinked, replace. Strainer in tank blocked, replace. Corrosion in tank, clean or replace.

\*Pressure reg. defective, check.



Pressureless

Fuel pressure

1 = Pressure regulator

2 = Return

3 = Test hose

4 = Measuring glass

# TROUBLE-SHOOTING PROGRAM ( 4 )

Check ignition-trigger-box voltage supply.

Detach ignition-trigger-box plug. Connect voltmeter to term. 4(+) and term. 2(-).

Switch on ignition.

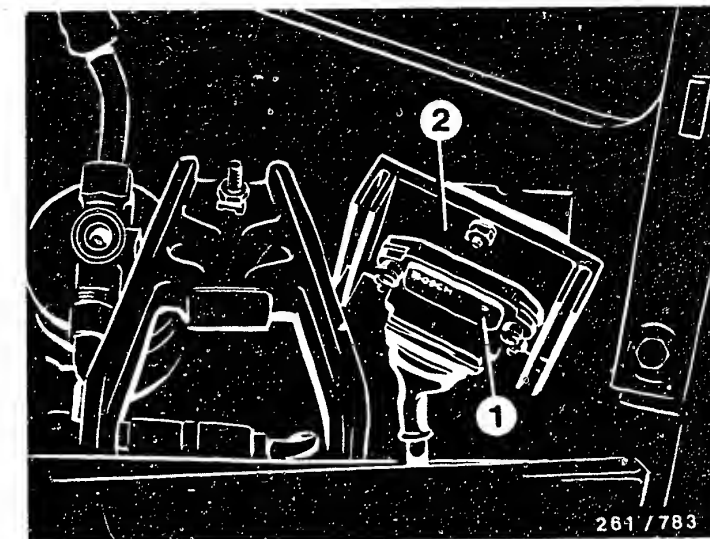
Set value: approx. battery voltage.

Is set value attained?

N>

Check for continuity in lead from ignition trigger box, term. 2 to vehicle ground and in lead from term. 4 to ignition and starting switch.

Eliminate open-circuits.



1 = Ignition trigger box  
2 = Heat sink

Check primary circuit.

Connect voltmeter to trigger-box plug, term. 1 (+) and term. 2 (-). Switch on ignition.

Set value: approx. battery voltage

Is set value attained?

N>

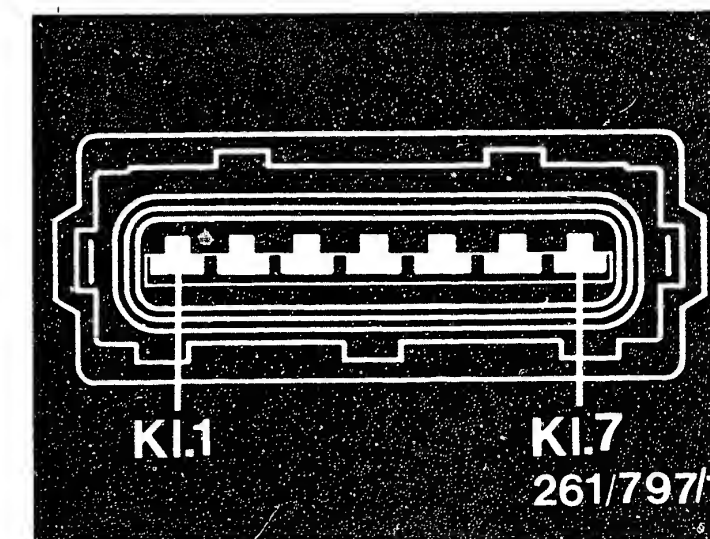
Check for continuity in lead from ignition and starting switch to ignition coil, term. 15. Check ignition-coil primary winding.

Set value: see brief instructions

Check for continuity in lead from ignition trigger box, term. 1 to ignition coil, term. 1.

Eliminate open-circuits, renew defective parts.

1 = Ignition-trigger-box plug



KI.1

KI.7

261/797/1

Return to trouble-shooting chart B03

E03

<=>

E04

<=>

# TROUBLE-SHOOTING PROGRAM ( 5 )

Check trigger box actuation.

Connect oscilloscope in accordance with operating instructions to trigger-box plug, term. 5(+) and vehicle ground.

Start engine.

Oscilloscope must indicate a rectangular signal with a voltage magnitude in excess of 5V.

Signal O.K.?

N>

Check lead from trigger box, term. 5 via engine plug, term. 1 to Motronic control unit, term. 1 for continuity and short-circuit. Eliminate open-circuits and short-circuits.

Replace Motronic control unit if lead was O.K.

Check function of trigger box.

Connect motortester to ignition coil, term. 1 and term. 15.

Start engine, measure dwell angle.

Is a dwell angle (undefined value) indicated?

N>

Renew trigger box.

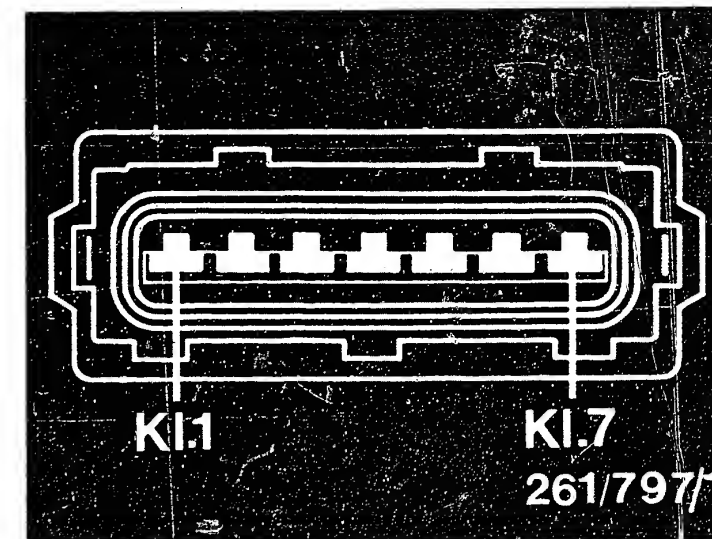
Return to trouble-shooting chart B03

E05

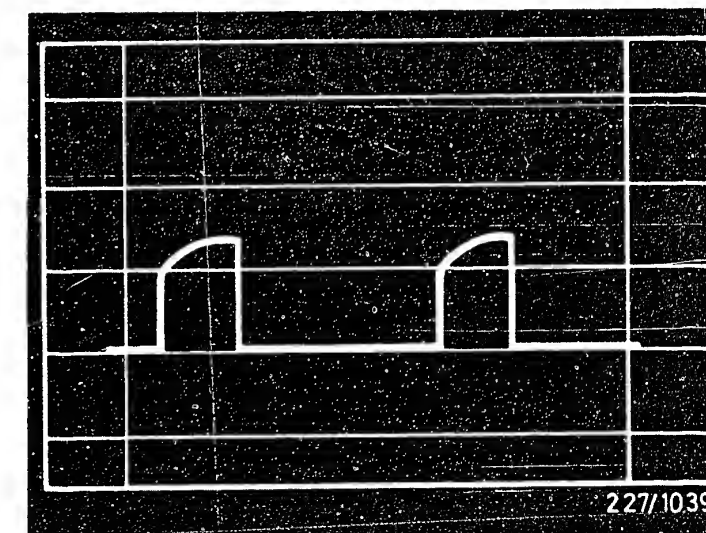
<=>

E06

<=>



1 = Ignition-trigger-box plug



# TROUBLE-SHOOTING PROGRAM ( 6 )

Check ignition coil.

Visual check:

Remove hood from ignition coil and check that plug (top picture) is in position and that no sealing compound has escaped.

Electrical test:

Measure resistance of ignition coil on primary side (term.15 and term.1; take resistance of test lead and test prods into account) and on secondary side (term.1 and term.4):

SET VALUES:  
see brief instructions

Plug in position and no sealing compound escaped?

Resistance values O.K.?

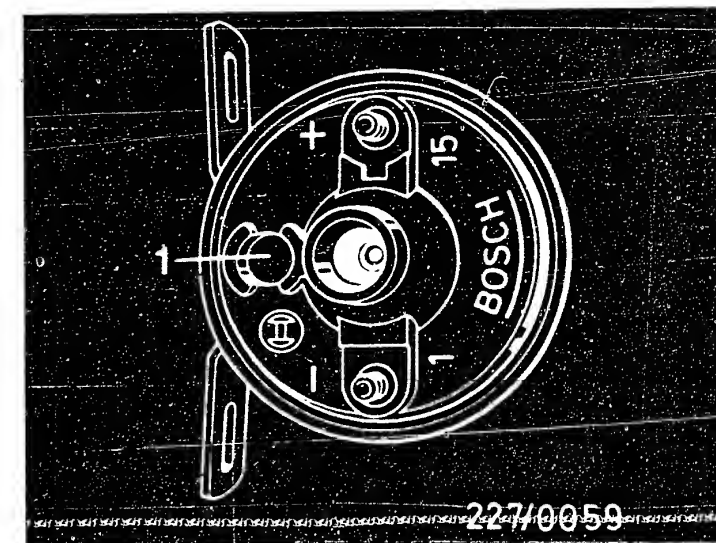
N>

1. Plug not present or sealing compound escaped:

Replace ignition coil, trigger box and control unit.

2. Resistance values outside tolerance limits:

Replace ignition coil.



1 = Plug

Return to trouble-shooting chart 803



# TROUBLE-SHOOTING PROGRAM ( 7 )

Check fuel pressure with engine running.

Let engine idle.

Fuel pressure  
SET VALUE: approx. 0.5 bar  
lower than with engine stopped.

Set value obtained?

N>

Check fuel pressure after  
switching off engine  
(checking for leaks).

Fuel pressure  
SET VALUE: min. 1.0 bar  
after 20 minutes.

Set value obtained?

N>

After testing is finished:

Remove jumper and connect  
pump relay in connection  
base.

Remove pressure tester.  
Connect fuel-inlet hose to  
fuel-distribution pipe.  
Make sure there are no leaks.

Return to trouble-shooting chart  
B03

\*Intake-manifold-pressure  
energization of pressure  
regulator not O.K. Hose line  
between pressure regulator  
and intake manifold clogged  
or leaking -> replace.  
Hose line dropped off ->  
re-connect.

\*If intake-manifold-pressure  
energization O.K. -> replace  
pressure regulator.

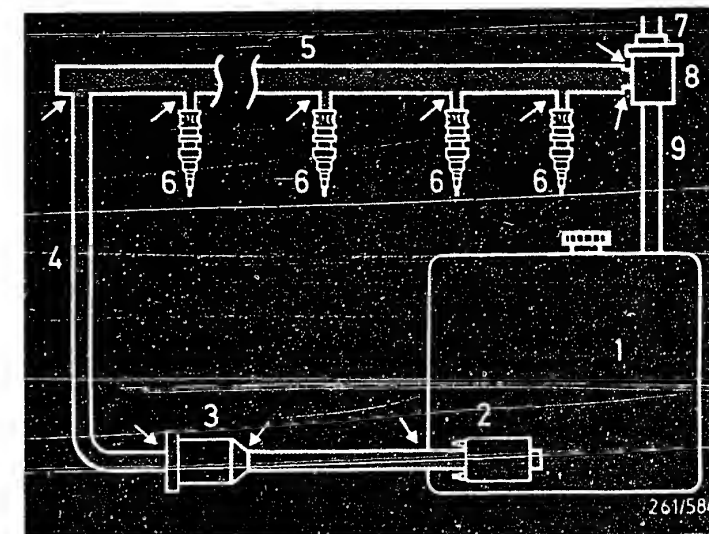
\*Leaking at joints between  
components, fuel hoses and  
fuel lines -> tighten hose  
binder or replace hose.

\*Pressure regulator (diaphragm)  
leaking -> replace.

\*Electric fuel pump (non-  
return valve) leaking.  
With screw-type non-return  
valve -> replace.  
With integral non-return valve  
-> replace electric fuel  
pump.

\*Pressure damper or fuel  
filter leaking -> replace.

Continued on next picture page



- 1 = Fuel tank
- 2 = Electric fuel pump  
(in tank)
- 3 = Fuel filter
- 4 = Inlet, fuel-injection tubing
- 5 = Fuel-distribution pipe
- 6 = Injection valves
- 7 = Intake-manifold pressure connect
- 8 = Pressure regulator
- 9 = Return line

Arrow = Possible leaking  
junctions

\*Renew O-ring if there is a leak in injection valve(s) at point of connection with fuel distributor. See text further down.

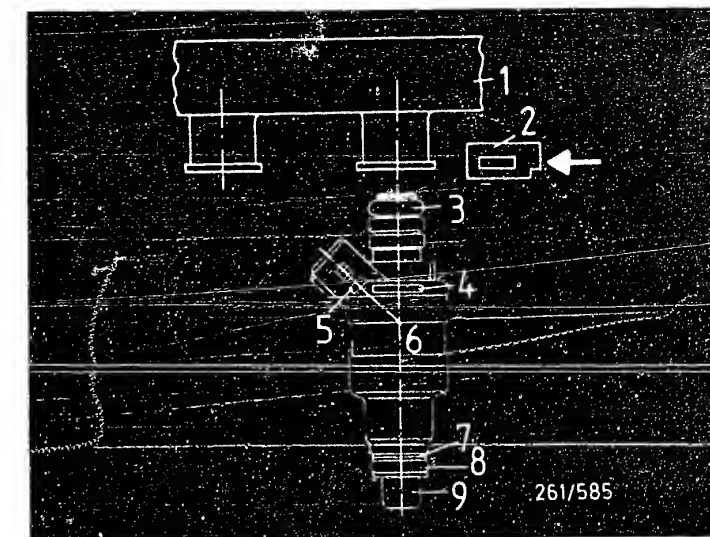
\*Check injection valve(s) (needle seat) for leaks:

Remove complete fuel distributor. Supply and return remain connected. Pull all injection valves simultaneously out of intake-manifold guide.

Fit jumper in both term. 87 and term. 30 in connection frame of Motronic relay (G5 in central-electrics console). Electric fuel pump must run.

Set value :  
No droplet may drip off from the injection valve within 60 seconds. If it does so, renew injection valve.

Removal:  
Detach connector.  
Pull out retaining clip.  
Remove injection valve.  
Caution!  
Catch any fuel which runs out; it must not be allowed to make contact with hot engine parts.



- 1 = Fuel-distribution pipe
- 2 = Holding clamp
- 3 = Upper O-ring
- 4 = Part number
- 5 = FD mark
- 6 = Injection valve
- 7 = Supporting plate
- 8 = Lower O-ring
- 9 = Protective sleeve

Continued on next picture page

If injection valve (needle seat) is leakproof but O-ring is defective, then renew O-ring.

Use new parts set.  
Caution! Do not damage protection sleeve and valve needle.

Renew upper O-ring (fuel distributor) if it is damaged.

Cut up lower O-ring (intake manifold) if it is defective.  
Fit new O-ring over protection sleeve and its beading.

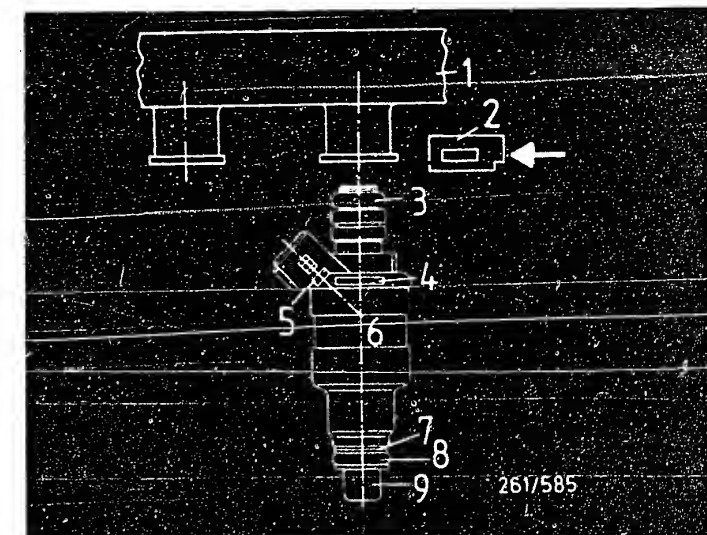
#### Installation:

Only grease O-rings slightly (silicone grease Ft 2 v 1).  
Attach injection valve to fuel distributor.  
Slip retaining clip into groove and allow it to engage.  
Check for fuel leaks.  
Fit connector.

Install complete fuel distributor.  
In doing so, press all injection valves evenly into intake-manifold side.

#### Caution!

Do not damage O-rings and/or valve needles.  
Make sure there are no intake-manifold leaks.



- 1 = Fuel-distribution pipe
- 2 = Holding clamp
- 3 = Upper O-ring
- 4 = Part number
- 5 = FD mark
- 6 = Injection valve
- 7 = Supporting plate
- 8 = Lower O-ring
- 9 = Protective sleeve

# TROUBLE-SHOOTING PROGRAM ( 8 )

Mechanically check air-flow sensor:

Remove air-flow sensor.

Open sensor flap by hand.

It must be possible to open sensor flap smoothly with ease to the stop and it must reclose to the stop automatically.

Sensor flap must not catch during opening.

Watch for traces of rubbing.

Clean air-flow sensor if heavily soiled inside and wipe with lint-free cloth.

Can sensor flap be opened easily and smoothly?

No traces of rubbing visible?

Replace air-flow sensor.

Continued on next picture page

Electrical test of air-flow sensor:

Remove air-flow sensor.

Leave plug on. Push back rubber sleeve on plug.  
Connect voltmeter to plug term. 2(+) and term. 4(-) with test prods.  
Switch on ignition.  
Measure voltage.

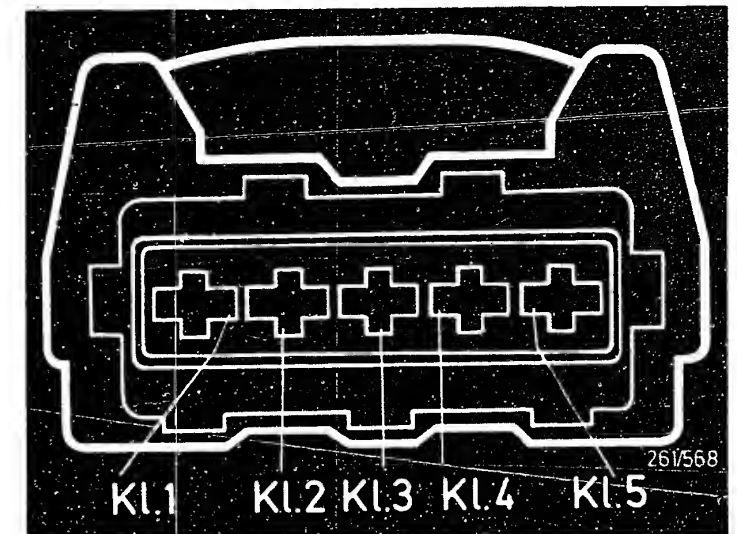
SET VALUES:

Sensor flap in rest position:  
200...300 mV

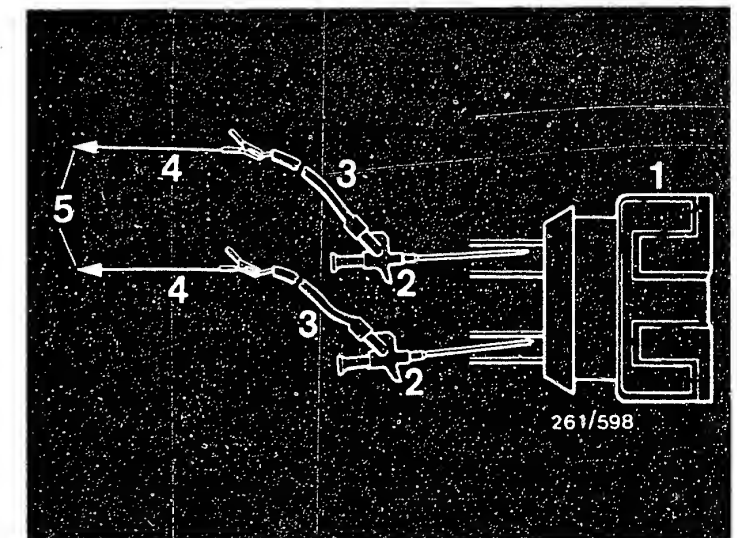
Open sensor flap by hand as far as it will go:  
greater than 4,2 V

Set values obtained?

Replace air-flow sensor.



Top view of plug for air-flow sensor



Continued on next picture page

Using oscilloscope, check potentiometer in air-flow sensor (noise test).

\* Remove air-flow sensor. Leave electrical connector connected. Push back rubber grommet.

Set motortester to special input.

Connect red clip to term. 2, black clip to term. 4 of air-flow sensor.

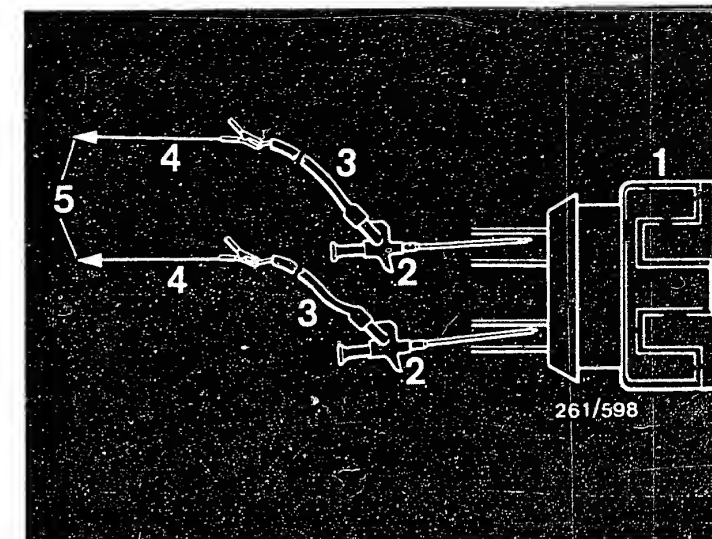
\* Fabricate adapter lead: two approx. 1 m long leads, approx. 1.0 mm <sup>2</sup> cross-section.

Secure 2 test prods to the one end. On the other end, remove approx. 2 cm of plastic insulation and clamp to the terminals of the special-input connecting lead.

**A T T E N T I O N !**

Insulate bare junctions of the adapter lead. (Danger of short circuit). Carefully insert into the connector of the air-flow sensor.

Do not bend spring contacts! Set control lever for picture adjustment on motortester to left-hand stop (calibrated adjustment).



- 1 = Air-flow-sensor connector
- 2 = Clamp-on test prod
- 3 = Adapter lead (user-fabricated)
- 4 = Special-input connecting lead
- 5 = Motortester special input

Continued on next picture page



# TROUBLE-SHOOTING PROGRAM ( 8 ) CONTINUED ( 3 )

\* Switch on ignition.

\* Violently deflect air-flow-sensor flap several times.

If air-flow sensor is in good working order, a stroke signal without dips must be visible on the oscilloscope.

If the air-flow sensor is defective, a noise signal similar to that in the figure opposite appears.

Replace air-flow sensor.

Disconnect adapter lead after the test and connect rubber grommet properly.

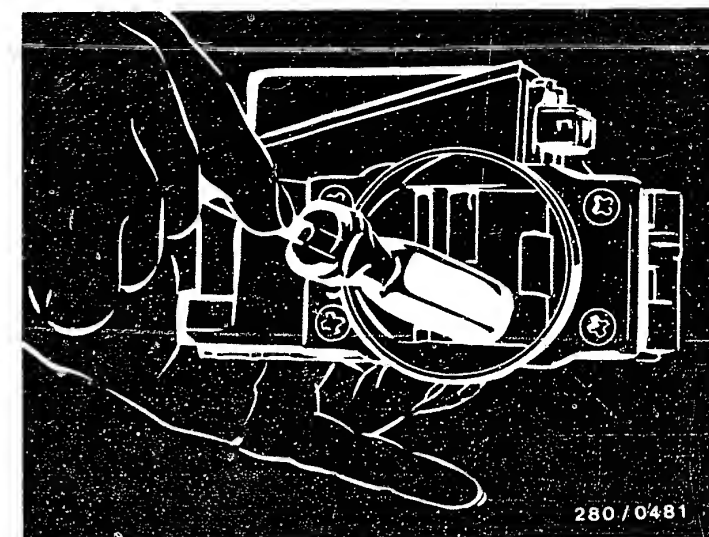
Fit air-flow sensor.

Connect all hoses and tighten (make sure of no leaks).

Signal O.K.?

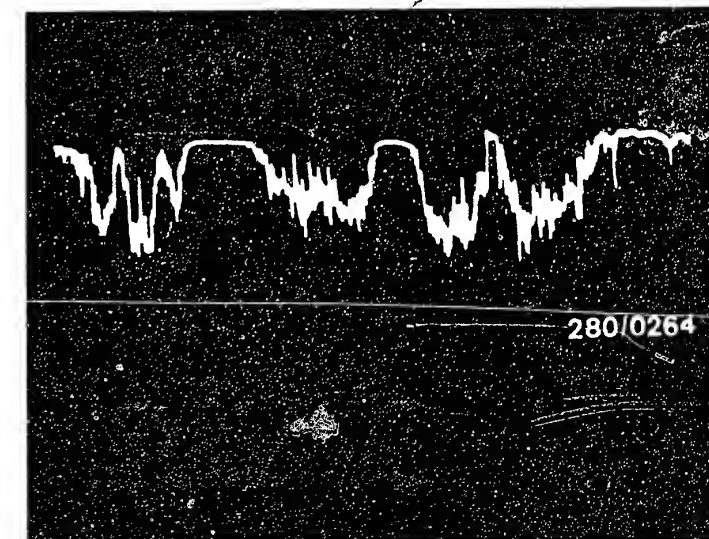
N>

Exchange air-flow sensor.



Push on air-flow-sensor flap.

Noise signal if air-flow sensor defective



Return to trouble-shooting chart B03

Check idle contact:

Detach plug at throttle-valve switch.  
Throttle valve closed.  
Connect ohmmeter to throttle-valve switch, term. 2 and 18.  
Set value: 0  $\Omega$  (continuity).  
Open throttle valve somewhat:  
Reading must change to infinity  $\Omega$ .  
Slowly close throttle valve again: Reading changes to 0  $\Omega$ .

Does resistance change from 0  $\Omega$  to infinity  $\Omega$  and vice versa?

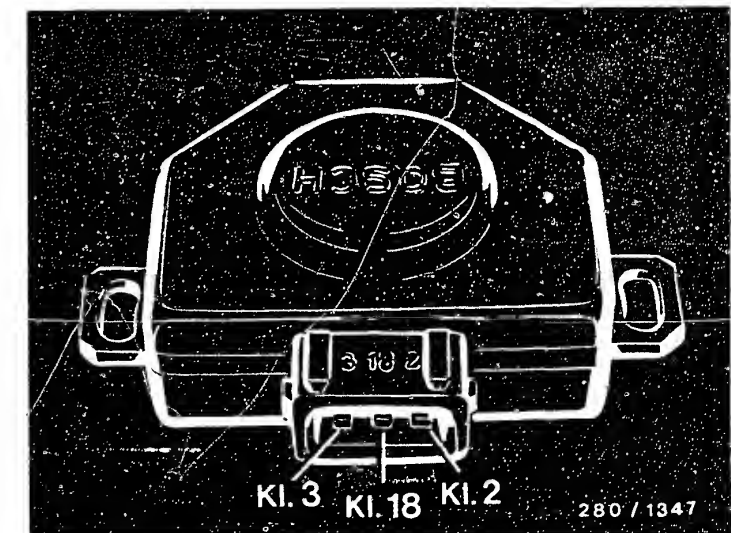
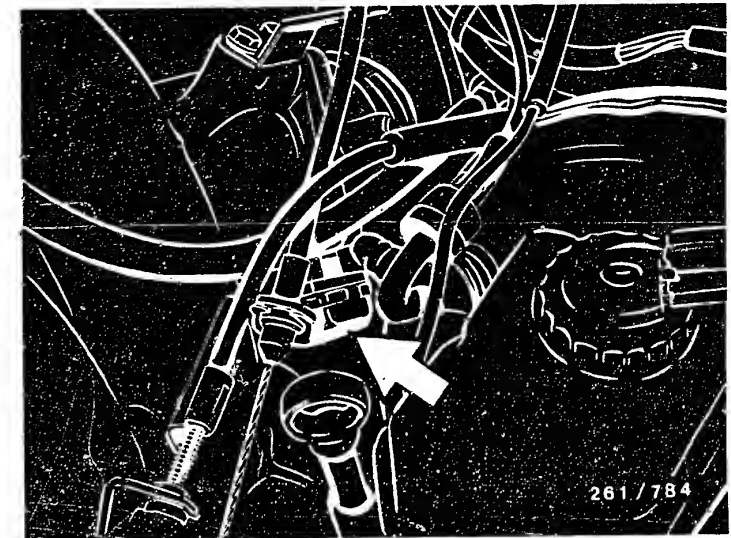
N>

\*Idle contact does not close (reading stays constantly at infinite  $\Omega$ ) or idle contact opens too late:  
Adjust throttle-valve switch.  
\*Conditions for adjustment of throttle-valve switch:  
+Throttle valve correctly adjusted? It must come up against the stop screw shortly before wedging with the lever. Lock screw to prevent maladjustment.  
+Adjust accelerator cable or linkage so that it is free of tension. If bent, replace.

Adjusting the throttle-valve switch:  
Slacken fastening screws slightly. Connect ohmmeter at throttle-valve switch between term.2 and term.18. Turn throttle-valve switch until idle contact closes. (Microswitch clicks audibly).

Reading 0  $\Omega$ . If not, replace throttle-valve switch.

Adjustment check:  
Tighten accelerator cable slightly. Idle contact must open (microswitch clicks audibly).  
Reading: infinite  $\Omega$ .



Continued on next picture page

V

Check following leads for open-circuit using ohmmeter:

From control unit, term. 52 to throttle-valve switch, term. 2 as well as from throttle-valve switch, term. 18 to ground.

Set values: 0  $\Omega$

Check connectors for corrosion and loose contacts.

It should not be possible to push back the contacts.

Are set values attained?  
Contacts O.K. ?

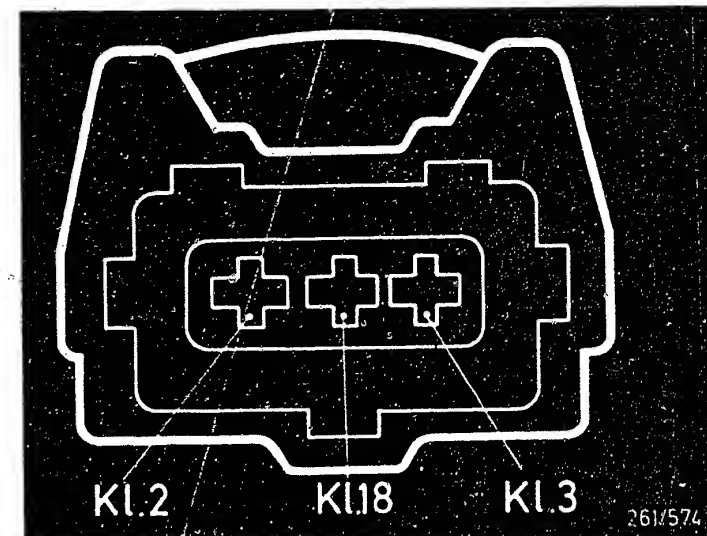
N&gt;

Repair defective lead/plug.

Y

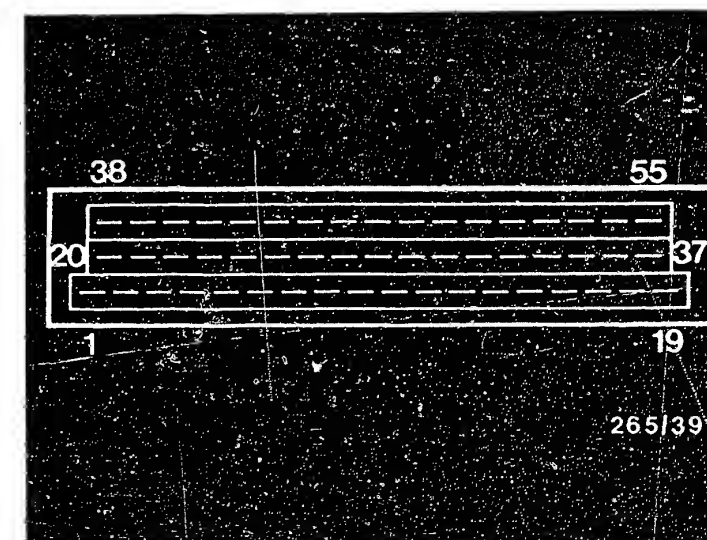
V

Continued on next picture page



Throttle-valve-switch plug

Top view of 55-pin control-unit plug for Motronic wiring harness



Check full-load contact:

Detach throttle-valve-switch  
plug.  
Connect ohmmeter to throttle-  
valve switch  
term. 3  
and term. 18

Open throttle valve as far  
as it will go:

Set value:  
Reading changes from  
infinity  $\Omega$  to 0  $\Omega$  before  
reaching full-load stop.

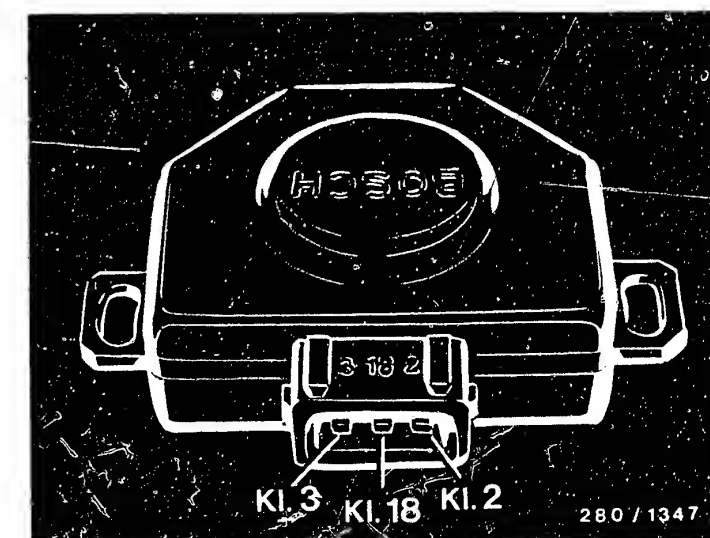
Does reading change from  
infinity  $\Omega$  to 0  $\Omega$  ?

N>

\* Resistance value remains  
constantly on approx. 0  $\Omega$  (full-  
load contact does not open):  
Replace throttle-valve  
switch.

\* Full-load contact does  
not close (reading remains  
constantly on infinity  $\Omega$ ):  
Check whether throttle valve  
is mechanically capable of  
opening fully.  
If mechanical system is O.K.,  
replace throttle-valve switch.

N o t e :  
Full-load contact cannot  
be adjusted. If idle contact  
is correctly set, then the  
setting of the full-load  
contact is likewise  
correct.



Continued on next picture page

TROUBLE-SHOOTING PROGRAM ( 9 ) CONTINUED ( 3 )

Check following leads for open-circuit using ohmmeter:

From control unit, term. 53 to throttle-valve switch, term. 3 as well as from throttle-valve switch, term. 18 to ground.

Set values: 0  $\Omega$

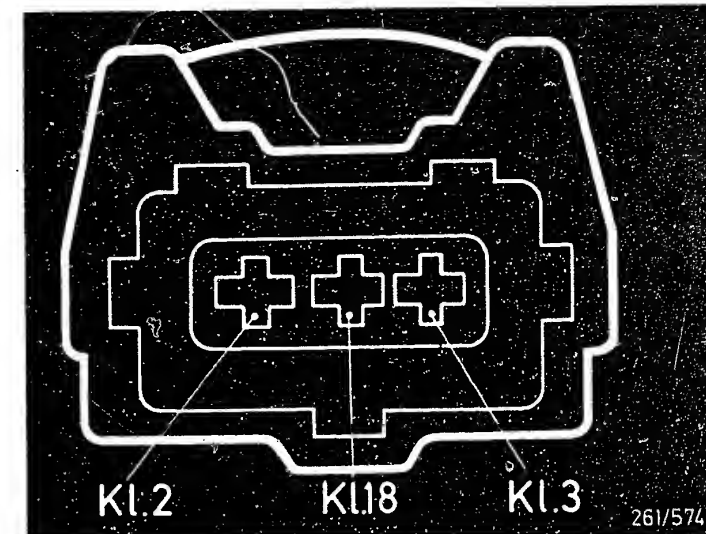
Check connectors for corrosion and loose contacts.  
It should not be possible to push back the contacts.

Are set values attained?  
Contacts O.K. ?

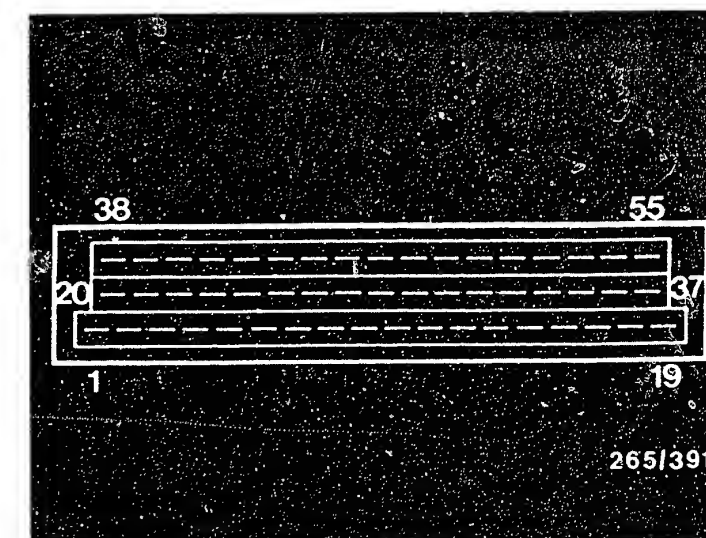
N>

Repair defective lead/plug.

Return to trouble-shooting chart B03



Throttle-valve-switch plug



# TROUBLE-SHOOTING PROGRAM (10)

Check air-intake system

Check whether hoses of air-intake system are correctly connected, not kinked or damaged.

Check whether oil dipstick has been inserted as far as it will go and whether the seal on the oil filler-neck cap is O.K.

With catalytic-converter models, check also that the tank-ventilation system (if applicable) is not leaking (visual examination).

Are all hoses O.K.?

N>

Replace hoses if necessary. Eliminate leaks by means of new seals or by retightening the hose clamps.

Continued on next picture page



TROUBLE-SHOOTING PROGRAM (10) CONTINUED ( 1)

Leakage test of the air-intake system.

Seal exhaust tail pipe.  
Unscrew hose from air-flow sensor to air-filter housing and seal air-flow-sensor duct.

Detach hose from crankcase vent. Seal opening to crankcase.  
Open throttle valve fully.

Blow air (0.3 bar gauge pressure) with compressed-air gun into intake manifold. Spray all sealing points with leakage detection spray or brush with soapy water.

Bubbles or foaming indicate leakages.

Are all points airtight?

N>

Eliminate leaks by means of new seals or by retightening the hose clamps.

Leaks may also occur at the following points: oil dipstick not securely inserted, defective seal at oil filler-neck cap etc.

Return to trouble-shooting chart B03

F05

<=>

F06

<=>

TROUBLE-SHOOTING PROGRAM (11)

V

Check tank-ventilation system.

Check visually whether hoses of tank-ventilation system are correctly attached, not bent or damaged.

Check whether hose connections at intake manifold, tank bleeder valve, active-carbon canister and fuel tank are leak-tight.

Are all hoses and connections O.K.?

N>

Replace defective hoses as necessary.

Eliminate leakages by tightening hose clamps.

V

Continued on next picture page

V

Function and freedom  
from leaks of tank-ventilation valve. N>

\*Valve must be noticeably  
clocked with engine running.

\*Remove tank-ventilation  
valve to check for leaks.  
Connect vacuum pump (e.g.  
Mityvac) to valve connection  
on intake manifold end.

1. Valve continuity when no  
current applied, i.e.  
no build up of vacuum possible.
2. Actuate valve with battery  
voltage (12 V); make use of  
connection lead  
KDJE-7450/70.

Generate vacuum of approx.  
0.5 bar. If tank-ventilation  
valve is intact, the vacuum  
slowly decreases. Approximate  
value: Drop in vacuum from  
0.5 to 0.25 bar at 12 V  
in approx. 10 s is  
permitted.

3. Valve deenergized.  
Seal other connection.  
Build up vacuum of approx.  
0.5 bar.  
There must be no decrease  
in vacuum.

Does valve satisfy all points?

Y

V

Return to trouble-shooting chart  
B03

1. Detach plug from  
valve.  
Check internal resistance:  
SET VALUE see brief  
instructions.

If set value is not  
obtained, replace tank  
bleeder valve, otherwise  
continue test with 2.

2. With the aid of test lead  
1 684 463 093 test  
activation of valve (on/off  
ratio is dependent on  
engine speed and load).  
Pulses must be visible  
at idle on oscilloscope  
(special input)  
(bottom picture).  
If no signal, check plug  
and lead to control unit,  
otherwise control  
unit is defective.

# TROUBLE-SHOOTING PROGRAM (12)

Check overrun cut-off:

Connect test lead 1 684 463 093 to a solenoid-operated injection valve.

Connect motortester special input in accordance with operating instructions.

Connect black terminal to vehicle ground.

Connect red terminal to test lead.

(Try out if necessary).

Run engine at 3000 min <sup>-1</sup>.

Fuel-injection signals can be seen (see top picture).

Release accelerator pedal suddenly.

SET VALUE:

With decreasing engine speed, fuel-injection signals are suppressed and cut in again above idling speed.

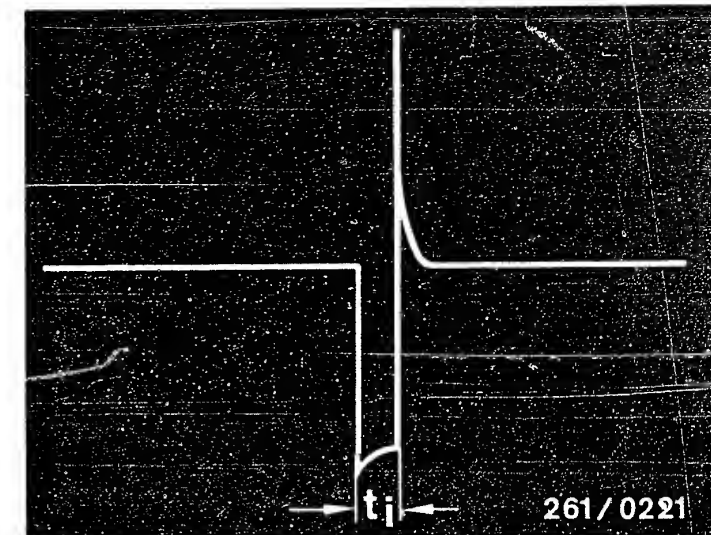
Set value O.K.?

N>

\* Repeat test.

\* Check idle contact in throttle-valve switch.

\* Control unit defective.



Injection signal  
t<sub>i</sub> = Duration of injection

Return to trouble-shooting chart  
B03

# TROUBLE-SHOOTING PROGRAM (13)

Check secondary patterns of all cylinders and interference-suppression resistors.

SET VALUES for interference-suppression resistors:  
see brief instructions

Secondary patterns and interference-suppression resistors O.K.?

N>

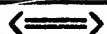
\*Outside and/or inside of distributor cap oil fouled?  
Scorch marks visible?

\*Check interference-suppression resistors, ignition cables and spark plugs.

\*When plugging on the ignition cables, note the cylinder numbers.  
Do not forget hood and screening cover.

Return to trouble-shooting chart  
B03

F13



F14



# TROUBLE-SHOOTING PROGRAM (14)

↓

Check ignition point.

N>

Connect motortester.

Warm up engine to operating temperature  
(engine oil above 60° C).

Switch off all loads.

Use TDC pickup for spark-advance-angle measurement.

Idle speed must be at specified set value (see brief instructions), otherwise a different spark-advance angle is indicated.

SET VALUE for spark-adv. angle:  
see brief instructions

Is set value obtained?

↓

Return to trouble-shooting chart  
B03

- + Idle speed correct?
- + Magnetic pulse generator  
(Hall generator) O.K.?
- + Control unit defective.



## TROUBLE-SHOOTING PROGRAM (15)

Check exhaust gas (CO):

Connect exhaust-gas analyser.  
Exhaust-emission measurement and adjustment are not necessary on vehicles with a catalytic converter, since the exhaust-emission value is corrected by the adaptive lambda closed-loop control.

Engine at operating temperature,  
switch off loads,  
set automatic transmission to N or P.  
Allow engine to idle.

SET VALUES:  
See brief instructions.

Set values O.K.?

N>

\*Mixture (CO) adjustment at bypass in air-flow sensor:

Remove plug in air-flow sensor.

Turn idle-mixture-adjusting screw in a clockwise direction, CO increases.

Turn idle-mixture-adjusting screw in a counter-clockwise direction, CO decreases.

If CO cannot be adjusted and mixture is too lean, repeat leak test on intake system. Following adjustment, fit new plug with 13 mm diameter. (See service-parts list)

\*See trouble-shooting chart for further potential faults.

Return to trouble-shooting chart  
B03

JEU DE PIÈCES POUR INJECTEURS

ELECTROMAGNETIQUES 280 150 2..

ET REGULATEURS DE PRESSION 0 280 160 2..

remplace édition 8.1982

13...39

VDT-I-261/102 Fr

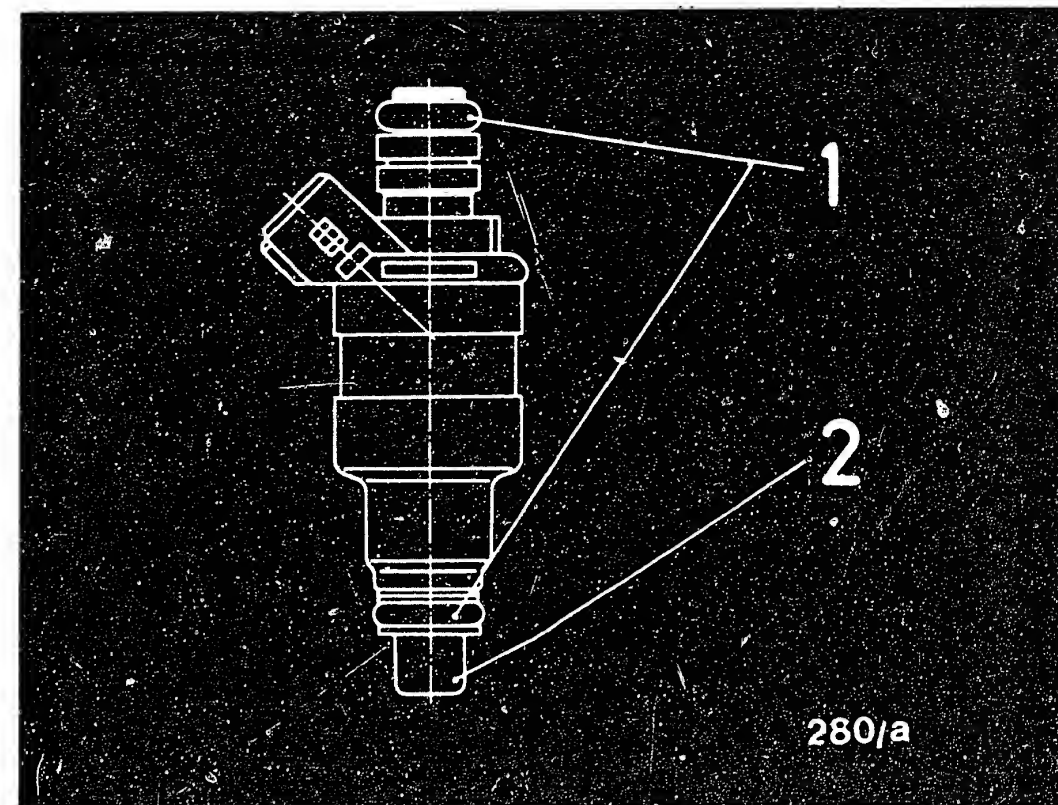
6.1983

Un jeu de pièces commun est disponible pour les injecteurs électromagnétiques et régulateurs de pression Motronic présentant la nouvelle technique de branchement.

Etant donné que les pièces indiquées ci-dessous sont soumises à des contraintes thermiques extrêmes, elles devraient être remplacées dans le cadre du service après-vente.

La prise d'air secondaire, due à un défaut d'étanchéité de l'injecteur, est une panne fréquente.

Le jeu de pièces qui porte la référence 1 287 010 704 est mentionné dans la microfiche des pièces de rechange pour les injecteurs (voir EE 00 sous 0 280..).



1 = joint torique

2 = manchon de protection

Contenu pour 1 injecteur :

2 x joints toriques

1 x manchon de protection, jaune

Contenu pour régulateur de pression

1 x joint torique

1 x rondelle d'appui

Responsable :

ROBERT BOSCH GMBH

Division KH

Service Après-vente Technique (KH/VKD 2)

En dehors de la République fédérale d'Allemagne, prière d'adresser les demandes à la représentation RG/AV du pays considéré.

## PLUG CONNECTORS FOR JETRONIC COMPONENTS

28  
VDT-I-280/111 En  
11.1984

Parts sets supersedes Ed. 11.1982

Parts sets are available for the replacement  
of Jetronic plug connectors, comprising:

- \* Plug-connector housing
- \* Protective cap (rubber sleeve)
- \* Contact springs

These parts are listed on microcard EE...\*

- \* See microcards EE00 and C 280 ..

- \* Plug, black, 2-pole,  
parts set 1 287 013 002 cable connector  
in conjunction with socket, 2-pole.

- \* Socket, black, 2-pole,  
parts set 1 287 013 001 for e.g.

Temperature sensor	0 280 130 0..
Auxiliary-air device	0 280 140 ..
Thermo-time switch	0 280 130 2..
Start valve	0 280 170 ..
Warm-up regulator	0 438 140 ..

- \* Socket, gray, 2-pole,  
parts set 1 287 013 003 for:

Injection valve 0 280 156 ..

- \* Socket, black, 3-pole  
parts set 1 237 000 039 for:

Throttle-valve switch 0 280 120 ..

- \* Socket, black, 5-pole,  
parts set 1 287 013 006 for:

Air-flow sensor 0 280 20. .. (LE version)

- \* Socket, black, 6-pole,  
parts set 1 287 013 004 for

Air-flow sensor 0 280 200 ..

- \* Socket, black, 7-pole,  
parts set 1 287 013 005 for:

Air-flow sensor 0 280 20. ..

Air-mass sensor 0 280 211 ..

- \* Wiring-harness plug connector, black, 25-pole,  
parts set 1 287 013 009 for:

Control unit 0 280 0..

- \* Wiring-harness plug connector, black, 35-pole,  
parts set 1 287 013 008 for:

Control unit 0 280 0..

The contact springs (minitimers) are also  
available individually under part number  
1 284 477 026.

The plug-connector housings are available  
only in the stated colors.

Published by:

ROBERT BOSCH GMBH  
Division KH  
Technical After-Sales Service (KH/VKD 2)  
Please direct questions and comments  
concerning the contents to our authorized  
representative in your country.

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